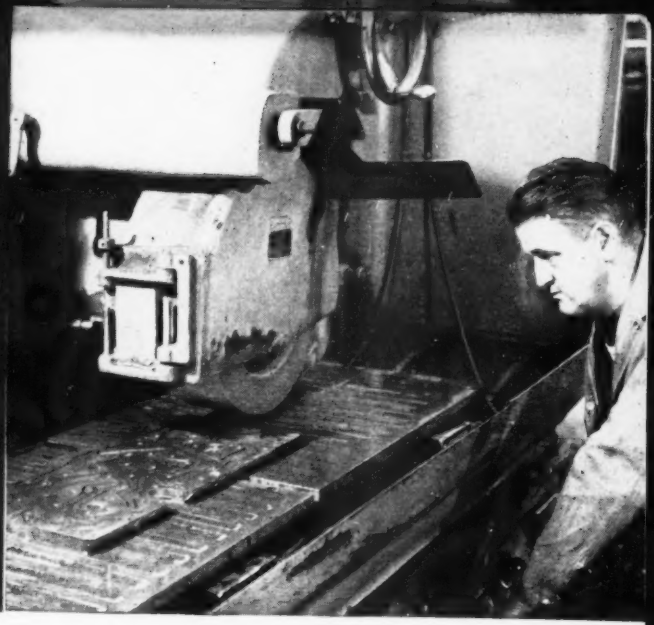
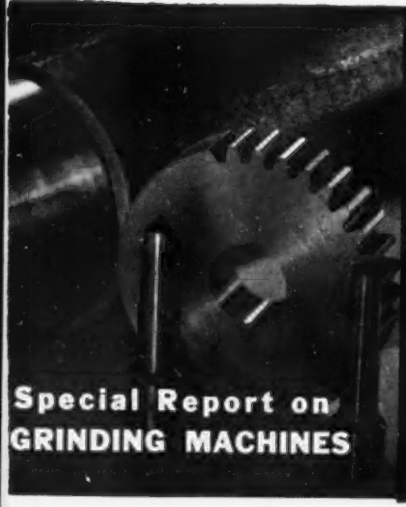
Machine and Tool



BLUE BOOK

ESTABLISHED 1906



Special Report on
GRINDING MACHINES

OCTOBER 1953

Machining Nickel Alloy Steels

Summary of New Materials

Studies Show Errors in Tooling Practices

Last Minute Washington News

Letters to the Editor

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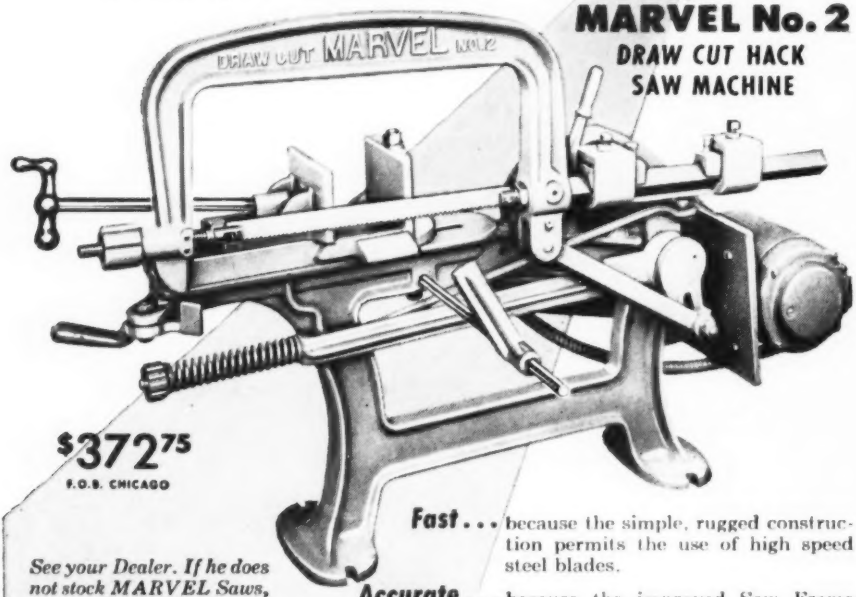
For... General-Purpose Sawing

FAST–ACCURATE–ECONOMICAL–DRY CUTTING

Capacity up to 8" round

Improved MARVEL No. 2 DRAW CUT HACK SAW MACHINE



$372.75
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See your Dealer. If he does not stock MARVEL Saws, he can get them quickly. Or simply write us for literature and delivery. When buying hack saw blades insist that your dealer furnishes genuine MARVEL High-Speed-Edge Hack Saw Blades—they are unbreakable!

Fast... because the simple, rugged construction permits the use of high speed steel blades.

Accurate... because the improved Saw Frame with clamping type blade holders holds the blade in perfect alignment and proper tension.

Economical... because of its automatic relief on the return stroke, the blade will last and last and last.

Dry Cutting... because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. · 5700 Bloomingdale Ave. · CHICAGO 39, ILL

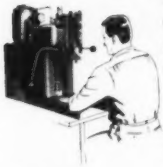
Do it BETTER, FASTER, FOR LESS with

MULTIPRESS®

Multipress offers maximum advantages of hydraulic power — *rapid action, wide adjustability, and accurate control* — in eight frame sizes that meet an unusually wide range of production needs.

Ram speed, maximum tonnage, and stroke length are quickly adjustable to changing needs. Stroke can be set for either distance or pressure limits. Choice of controls includes hand lever, push-button, foot-pedal, automatic cycling, and manual or electric dual-safety controls. Denison's exclusive "Vibratory Ram Action" is available to solve problems of air escapement from dies, density control, or uniform compaction.

Standard Multipress accessories offer extra speed and efficiency on many operations. These include Index Tables, Dial Feed Tables, a Harmonic Feed for coil stock, preform equipment, straightening fixtures, foil marking equipment and other specialized accessory tooling.



TOUCH CONTROL—Multipress is now available with "Touch Control". In *exact split-second relation* to the way the operator moves or presses the hand lever, this slave-type control causes the ram to start, stop, speed up, slow down, reverse or exert pressure. Pressure applied to the work can be varied at the user's option.

SELECT THE FEATURES THAT FIT *YOUR* JOB

SPECIFICATIONS		BENCH MODELS					FLOOR MODELS			
Frame Size		B	D	F	G	H	K	L	N	Q
Capacities (Tons)		1	2,3,4,6	2,4,8	5,10	5,10,15	25	35	50	75
Max. Ram Speeds (I.P.M.)	Closing	1100	1300	1300	700	700	530	530	290	210
	Pressing	400	570	570	220	280	250	250	145	110
	Opening	600	920	920	310	500	470	470	290	220
Max. Stroke		6"	12"	12"	12"	12"	15"	15"	15"	15"
Max. Daylight Open'g		15⅜"	12"	18"	24"	23"	24"	24"	24"	30"
Throat Depth		5"	6"	8⅛"	12"	10"	12"	12"	12"	10"

CHOICE OF MANUAL AND AUTOMATIC CONTROL VALVES FOR ALL MODELS

The DENISON Engineering Company

1184 Dublin Road
Columbus 16, Ohio

DENISON Hydr OIL ics

Write for: "MULTIPRESS and how YOU can use it"

All we did was to ask a simple question . . .

and E. J. Bowe *said* **"I have no complaints!"**

We wanted to know how Ed was getting along with his battery of 8 of our No. 7 Hand Screw Machines, and the production superintendent of the well-known General R-F Fittings Co. of Boston said something we were mighty pleased to hear:

"We're in a highly competitive field, yet where quality of the part has to be of first considera ion. I honestly think that without the help of the Wade No. 7 hand screw machine we never could turn out the large volume of R-F fittings that we do, and with hardly any down-time. We get no complaints from our operators, no complaints from our customers, and you'll get no complaints from me! I like these machines."

Wade no. 7

HAND SCREW MACHINES

in operation at

GENERAL R-F FITTINGS CO., BOSTON

producers of standard and special co-ax connectors, cable assemblies, wavemeters, crystal mounts, dummy loads, directional couplers, and other microwave components.

Notice this efficient turret set-up for one of the *General R-F Fittings*. See how the cut-away case-hardened steel tool blocks permit the operator to get tools closer to the nose of the spindle and hold closer tolerances.

- Spindle speeds, 315 to 3300 rpm
- 1" collet 4-to-1 Hi-Lo Speeds at finger tips
- Spindle stops without stopping motor

Send for catalog: 51 River Street

THE WADE TOOL CO.

WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

NEW

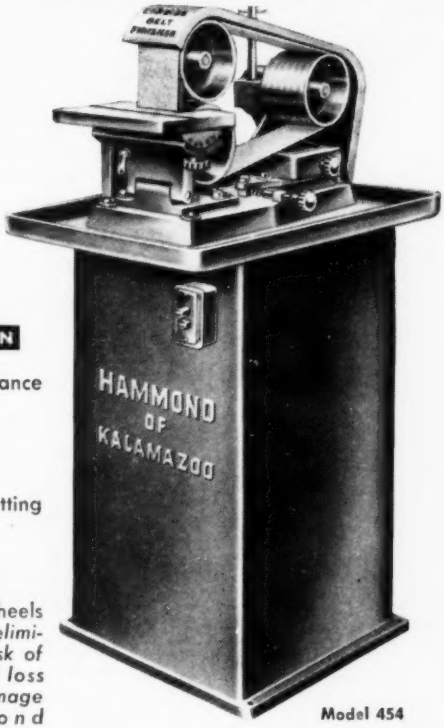
CARBIDE TOOL FINISHING METHOD

Hammond CARBIDE BELT FINISHER

NOW — it is possible to final-finish single-point carbide tools

***Without* diamond wheels**
***Without* highly skilled operators**

Here is a NEW METHOD AND NEW MACHINE which have been proved in actual production. The Hammond Model 454 Carbide Belt Finisher is for final finishing with an abrasive belt after rough grinding with a silicon carbide wheel. It features —



Model 454
Carbide Belt Finisher

TUNGSTEN CARBIDE FACED PLATEN

Permits finishing the end, top and side clearance angles of single point tools.

CONVENTIONAL TABLE

Nothing new for operators to learn. One setting for all size tools.

LOW COST INITIAL INVESTMENT

Using abrasive belts in place of diamond wheels means a low cost initial investment. Also *eliminates the risk of substantial loss due to damage to diamond wheels.*

"Seeing is Believing"
"Clip" this ad to your letterhead. We will arrange for you to use one. No obligation.

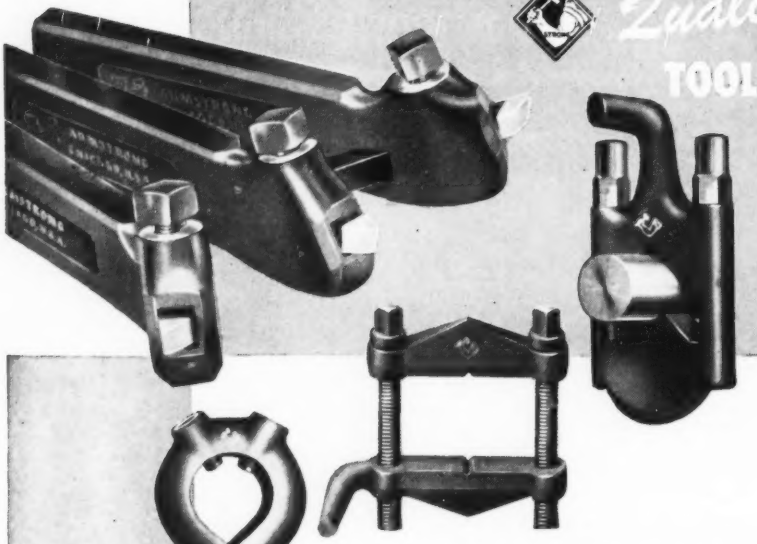
Hammond Machinery Builders INC.

1614 DOUGLAS AVENUE — KALAMAZOO, MICHIGAN

See us at Booth 1150—National Metal Exposition

ARMSTRONG

Quality TOOLS



Not a cost, but an investment that pays year after year

Buy **ARMSTRONG TOOL HOLDERS** and **TOOLS** for today's job and they will bring you added profits thru the years. With **ARMSTRONG TOOL HOLDERS** you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools, too. They are drop-forged from special open hearth steels, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays over and over again. Write for new S-48 catalog. It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5208 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

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Hitchcock Managers are Listed on Page 64

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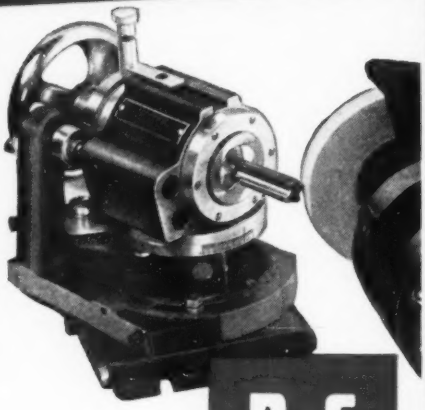
RELIEVES FORM TOOLS • RELIEVES CENTER DRILLS

RELIEVES TAPS • RELIEVES COUNTERBORES • RELIEVES SPHERICAL CUTTERS

RELIEVES PROFILE MILLS • RELIEVES REAMERS • RELIEVES STEP DRILLS

What a relief! ...RADIAL relief!

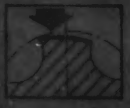
FOR MORE CUTS PER GRIND and BETTER CUTS — SHARPEN STRAIGHT and SPIRAL TOOLS WITH D • S



By actual user experience, radially relieved tools have outlasted tools with standard angular relief by as much as 5 times. They cut freer and better. D.S. is readily set up and radial relief can be produced by any good grinder hand without special experience. Hundreds of these fixtures are now in use.

D • S RADIAL RELIEF GRINDER

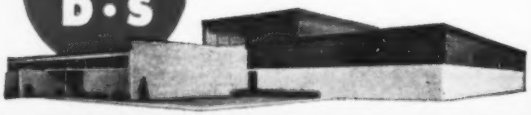
Blade is relieved eccentrically leaving all possible metal behind cutting edge for support.



Any amount of margin, parallel with cutting edge, can be left if desired on either straight or spiral tools.

NEW HOME OF D • S

WRITE FOR OUR CATALOG



D • S GRINDER DIVISION
Royal Oak Tool & Machine Co.
Stephenson Hyway • Royal Oak, Mich.

RELIEVES BORING BARS • RELIEVES HOLLOW MILLS

STRENGTH WITHOUT BULK
Exceptional strength of Mac-it Screws permits use of smaller, lower cost fastening screws.

PRECISION FASTENERS
Quality control provides all Mac-it Screws with high dimensional accuracy and uniformity—for class-3 fit.

MAC-IT SCREW ENGINEERING
Mac-it fastener engineering is available for screw design to suit all types of applications.

SPECIFY *Mac-it*® FOR ALL THESE ADVANTAGES

ONE MAC-IT CALL GETS 'EM ALL!

SPECIAL SCREW PRODUCTS
Mac-it is geared for small or large runs of screws with special design or strength characteristics.

HEAT-TREATING
Mac-it high-quality steel and heat treat process insure full toughness throughout all Mac-it Screws.

DISTRIBUTOR SERVICE
Hundreds of distributors from coast to coast insure prompt attention to all screw requirements.

MAC-IT SCREW DEPARTMENT
STRONG, CARLISLE & HAMMOND COMPANY
1392 W. 3RD. STREET • CLEVELAND 13, OHIO
Manufactured by Mac-it Parts Co., Lancaster, Pa.

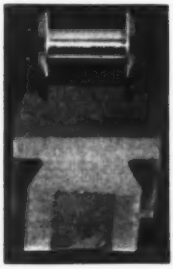
RIGHT ON

. . . Projecto-Form a 20X view

CINCINNATI

TIME 60% SAVED

Projecto-Form reduced the time to grind this form tool by 60%.



TIME 68% SAVED

Only four hours' grinding time required on the profile of the die for this part—30% of the former time.

TIME 70% SAVED

Entire contour of blanking punch ground by the Projecto-Form method. Time reduced by 68%.

CINCIN

THE NOSE

gives you of accuracy

CINCINNATI Projecto-Form, for accurately grinding tool and die parts.

Enlargement:
with Standard projection lens.. 20X
with Special projection lens.... 40X

Standard width of grind,
one setting ..... 9/10"

Maximum longitudinal adjustment 4½"

Complete specifications in catalog No. M-1612-3.

Like television, CINCINNATI Projecto-Form Grinding Machines eliminate a lot of intermediate steps and show you exactly what's happening at the point of action. Through an arrangement of lenses and a mirror, an intense light projects a silhouette of the work and wheel to a ground glass screen in front of which the operator is seated. A "drawing" of the desired contour, twenty times size, is cut on a glass plate coated with a tinted translucent emulsion. Mounted on the viewing screen, the drawing furnishes a guide to which the operator works. With two micrometer adjusting handwheels, he adjusts the wheelhead vertically and transversely while the grinding wheel reciprocates over the work. Grinding continues until the image of the work matches the drawing. ¶ The Projecto-Form method of grinding greatly reduces the cost of producing accurate form tools, die parts, and others. Illustrated on the opposite page are typical examples, and the time saved over previous methods. You may obtain complete specifications by writing for catalog No. M-1612-3. Brief data in Sweet's Machine Tool Catalog.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Grind 360 Non-Parallel Edges of Jet Turbine Buckets per hour

GARDNER

precision disc Grinders

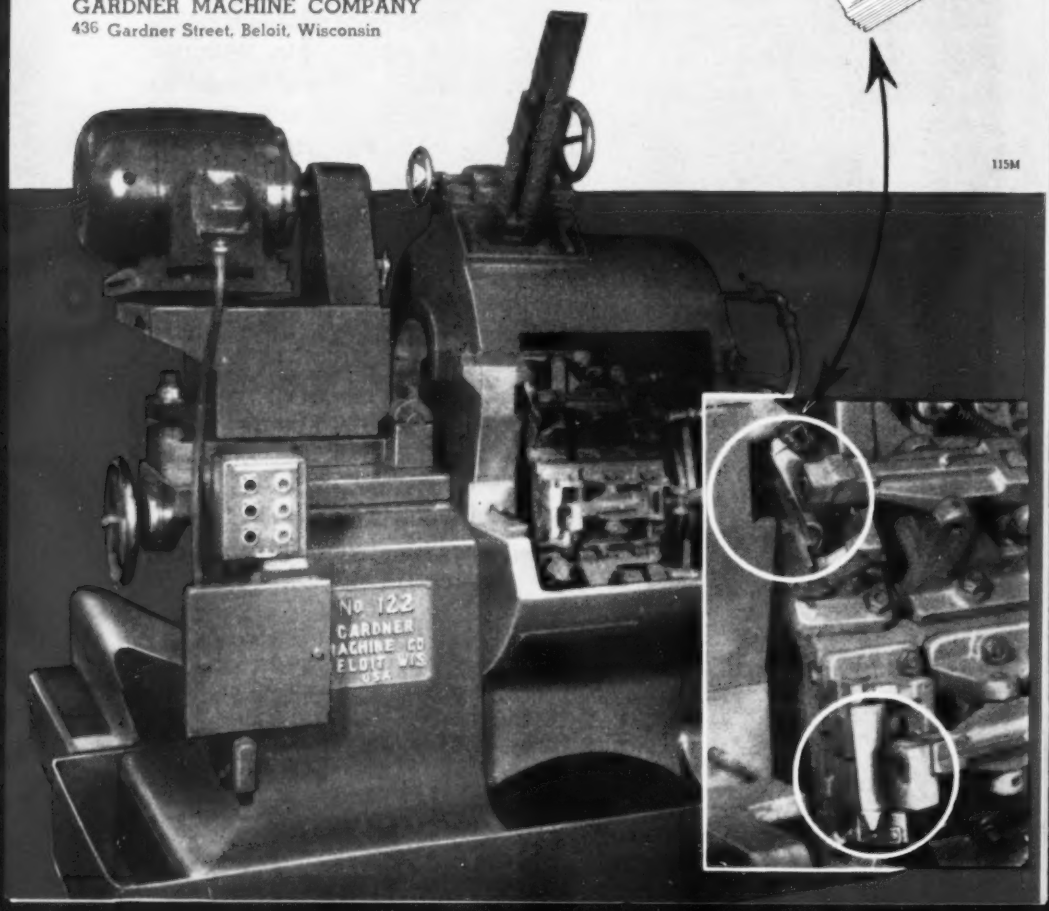
Gardner method solves production problems

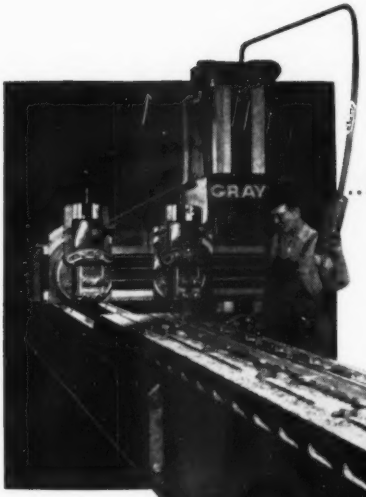
A Gardner No. 122-23" semi-automatic disc grinder gives this production by use of a rotary work carrier. Alternate fixtures permit grinding the two non-parallel edges. Each piece passes through the machine twice. Stock removal is 1/16" per surface.

For help on your flat surfacing problems consult Gardner.

GARDNER MACHINE COMPANY
436 Gardner Street, Beloit, Wisconsin

115M





...delivers high production-low cost carbide planing!

Here's high production — low cost carbide planing at the Beloit Iron Works, Beloit, Wis. This GRAY OPENSIDE PLANER CUB is running 300' per minute, day in — day out, carbide planing packing strip holders for suction rolls of paper making machinery.

BETTER BE QUICK!

or the job will be finished before you turn the page!

Planer jobs don't grow old on a GRAY!

Ever see a planer running wide open, day after day at 300' per minute? That's the pace of a new GRAY — the pace that makes your old planer look really old.

Why should you be interested?

Because a GRAY CUB is not only an economical initial investment — it also insures substantial savings in time and money thru its high speed, accurate production ability.

Write today—get the story on GRAY
HIGH LOW COST PRODUCTION

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

DEPT. D

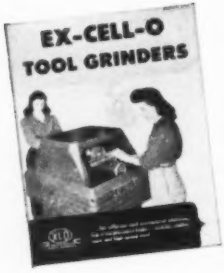
CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Tool Grinders by Ex-Cell-O

STYLE 44-A, Ex-Cell-O Precision Carbide Tool Grinder. A new model for sharpening single point tools. Inbuilt motor precision spindle. Ample pressure coolant flow.

FOR CARBIDES— CAST ALLOYS— HI-SPEED STEELS

A complete line of grinders, for efficient and economical sharpening of single point tools. All are double-end models using cup type wheels; with large tool rest tables, easily adjusted.



WRITE FOR THIS BULLETIN

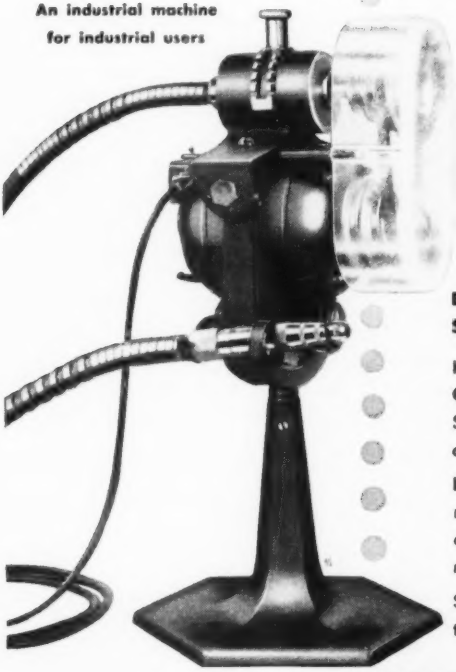
It shows and describes five models; also gives important data on tool grinding. Address Ex-Cell-O in Detroit; ask for BULLETIN 46262.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
XLO
EX-CELL-O for PRECISION

53-26

VERSATILE PERFORMERS

An industrial machine for industrial users



Jarvis

POWERFUL FLEXIBLE SHAFT MACHINES

BENCH, FLOOR, OR OVERHEAD SUSPENDED MODELS

Here are truly versatile machines that will do your GRINDING, CUTTING, BUFFING, DISC and DRUM SANDING, WIRE BRUSHING, and ROTARY FILING operations — Faster and More Economically.

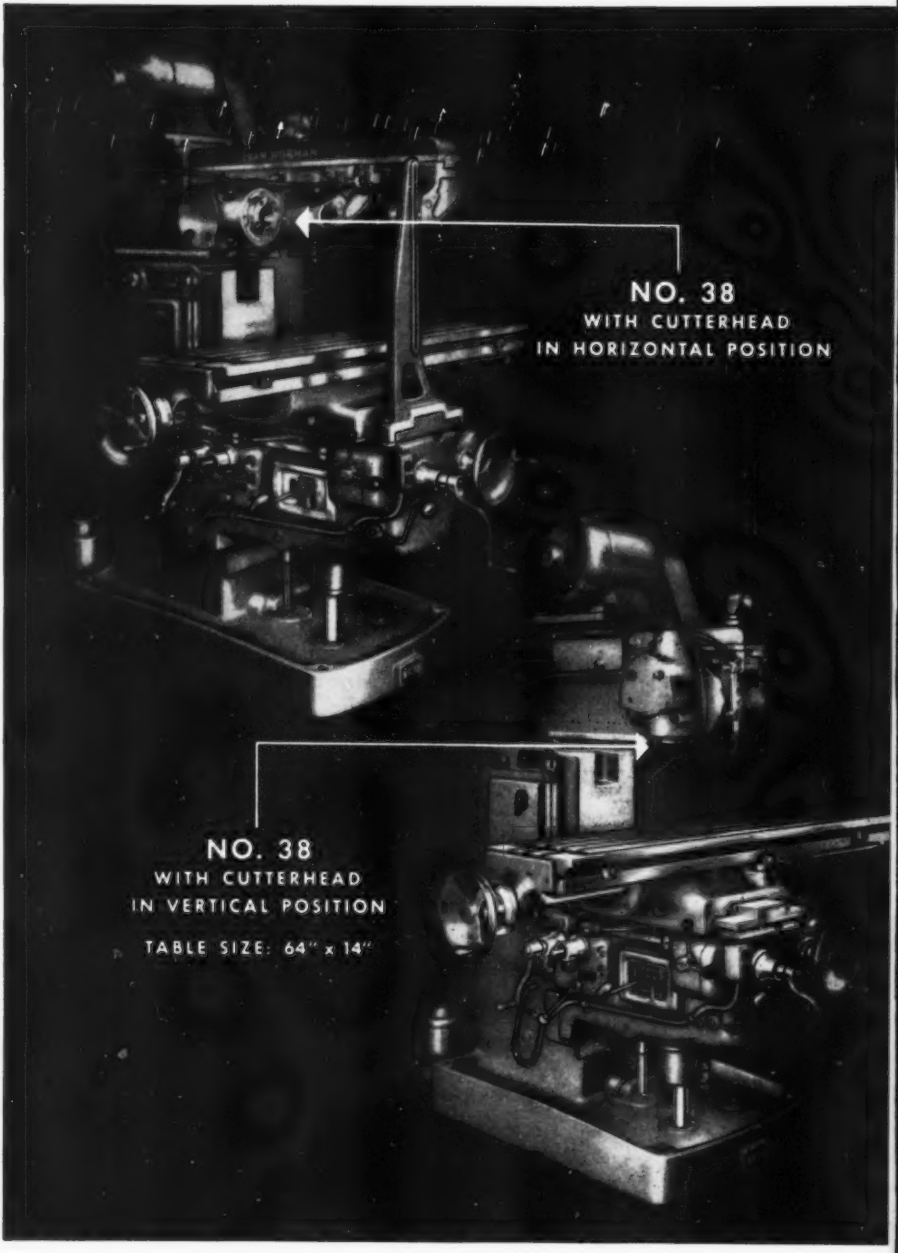
Let a Jarvis representative aid in analyzing your needs. This service is available without cost and assures you of getting the *right* machine in the *right* place at the *right* time.

Send for our complete catalog containing illustrations and specifications of various models.

JARVIS
POWER TOOLS

TAPPING ATTACHMENTS • TAPS • FLEXIBLE SHAFTS AND MACHINES • ROTARY FILES • TUNGSTEN CARBIDE REAMERS • MILLS • DRILLS • BORING BITS

THE
CHARLES L. JARVIS CO.
MIDDLETOWN IN CONNECTICUT


NO. 38
WITH CUTTERHEAD
IN HORIZONTAL POSITION
NO. 38
WITH CUTTERHEAD
IN VERTICAL POSITION
TABLE SIZE: 64" x 14"

VAN NORMAN

Ram Type Millers Give You

MORE USEFUL WORKABILITY per Machine

The advantage of Van Norman Ram Type Millers is their versatility to meet the daily milling requirements by enabling operators to perform horizontal, angular or vertical milling, using conventional milling practice and standard arbors and cutters, all with one machine.

Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

In addition, the movable ram in combination with the saddle cross feed increases the work range and capacity of work that can be handled.

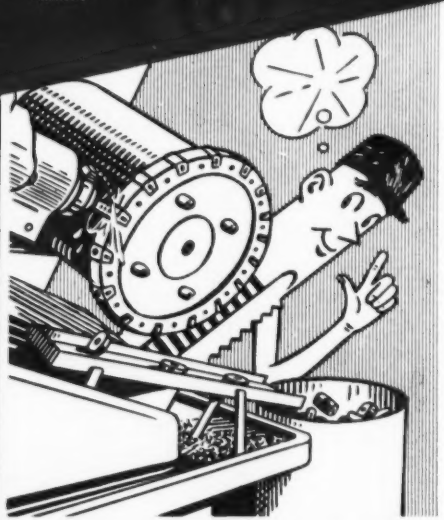
Because Van Norman Ram Type Millers enable you to meet all milling jobs, they keep operators and machines working. They cut costs, improve accuracy and increase production.

Write for information and catalog describing Van Norman Ram Type Millers.

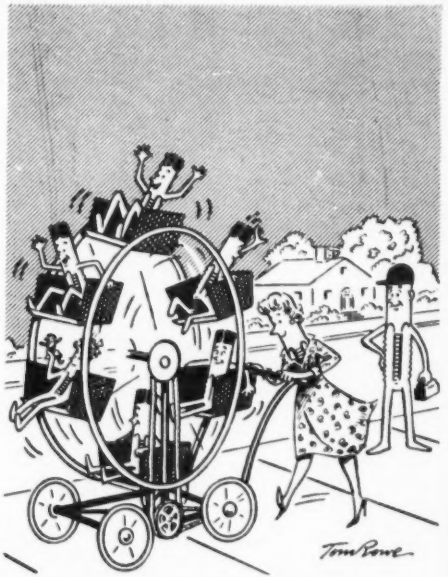
VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

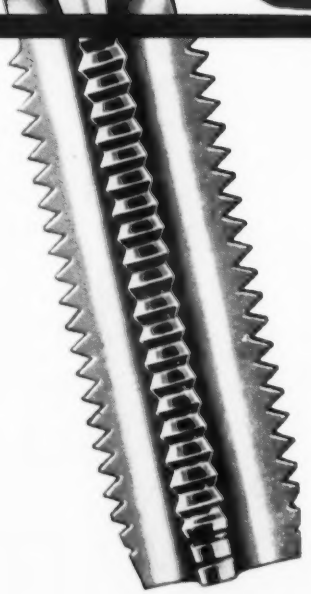
TAP-ODDITIES



Round and round the rotary goes
At mass production speed.
Pete sez: "For real economy—
Bath Taps are what you need!"



This go-cart — on the rotary plan,
Solved Pete's production woes.
His "wheel of fortune", spins around —
And where she stops — nobody knows!



In these days of long runs, "production tapping" is an art. Considerable study must go into the cycle and handling time.

1. The cycle is the time necessary to complete a full tapping stroke and is dependent on the spindle speed and the pitch of the thread. The only productive time, is while the tap is actually cutting the thread — therefore, the reversing speed is usually increased to a 2 to 1 ratio.

2. Handling time varies with the operator — or with mechanical factors, if the feed and discharge is automatic. Some threading jobs have a long handling time and a short cycle, while others may be just the opposite.

Study of the style of tap used is important — and Bath engineers are often able to make a slight change in a stock tap to give better operating efficiency and step up the tapping cycle.

Let a Bath representative check your production tapping set-up. He'll help you get Better Threads with Bath Taps.

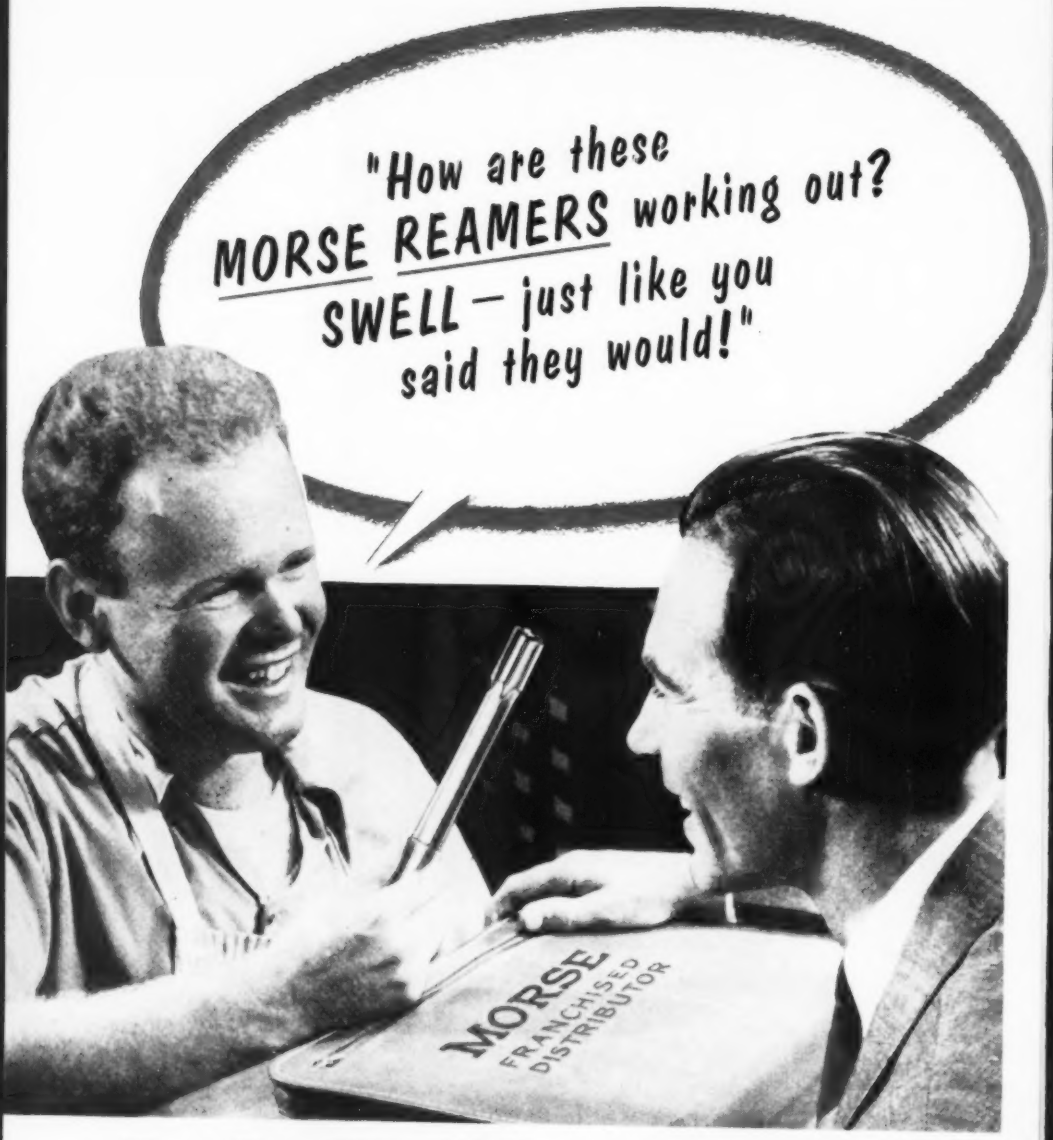
INSIST ON BATH TAPS
— PROFIT BY THEIR
PLUS — PERFORMANCE

JOHN BATH CO. INC · WORCESTER · MASS ·

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

14 Grafton St., Worcester, Mass.


"How are these
MORSE REAMERS working out?
SWELL — just like you
said they would!"
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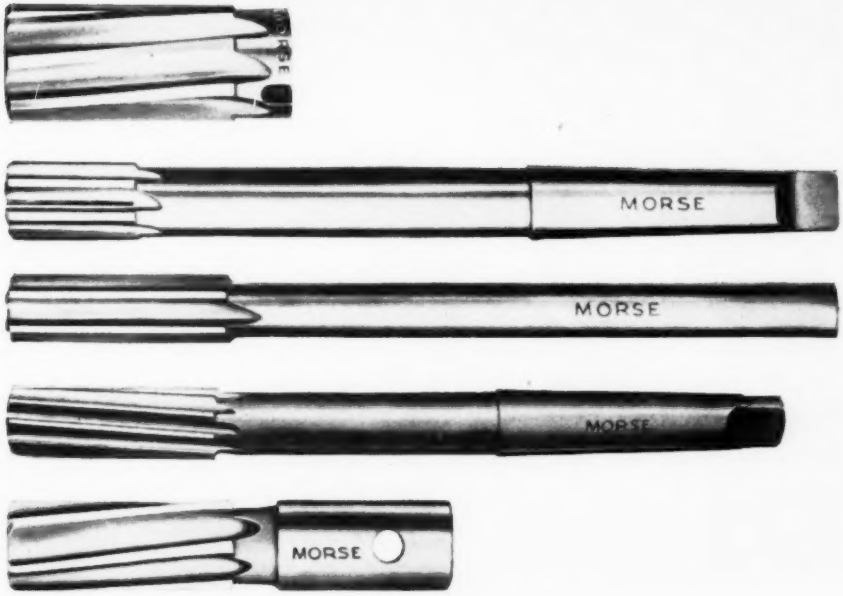
DISTRIBUTOR

MORSE



See your Morse-Franchised Distributor about

MORSE REAMERS

for "Top-Hole" performance on every job

Staggered flute-spacing is the payoff feature of Morse Reamers. It ends biting, slipping . . . gives you smooth cutting and *accurate hole-sizing every time.* Chips are cleared freely, with no galling or scoring of the surface.

Morse makes *all* types of Reamers, for ferrous and non-ferrous . . . including the Morse Expanding Chucking Reamer which can be reground again and again . . . and even including the huge tools used in bridge and structural work. What's more, you can get Morse Reamers *Electrolized* for extra life, if you wish.

Talk it over with your Morse-Franchised Distributor . . . he's got the know-how and the stock to start you toward better work and greater savings than you ever expected from this type of cutting tool. *Call him today.* He'll give you your first saving (in time) right now.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

Manhattan Moldisc—More use per dollar

A FRESH CUTTING FACE . . . throughout the life of the wheel means that Manhattan Moldiscs last longer . . . retain full metal removal efficiency right down to the last usable part of the wheel. The secret — Manhattan's special molded, resinoid bonded abrasive which presents a fresh cutting surface throughout the wheel thickness, and which does not load or glaze. Actual plant tests show that Moldiscs effect important savings in faster grinding time and fewer time-outs for disc changes. For MORE USE PER DOLLAR and better quality work specify Manhattan Moldiscs. Bonded in various resiliencies from fast roughing to fine finishing. Standard size 7" x ¼" x ⅞". For speeds to 6,000 RPM. Mounting flange and nut furnished on request.

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO ABRASIVE WHEEL DEPARTMENT

RM

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RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose
Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles • Teflon
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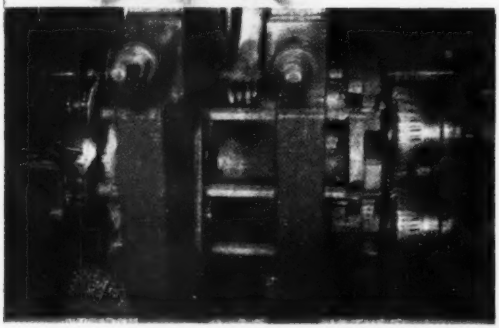
MR 943-R

THERE IS NOTHING HARDER THAN A DIAMOND but WESSONMETAL IS TOUGHER!



ACTUAL JOB
Large Automobile Plant

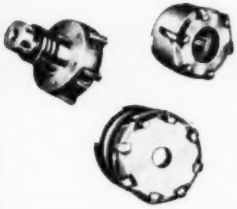
Machine	Davis Thompson Milling Machine
Part	Rear axle shaft
Operation	Rough and finish mill spline end
Material	S.A.E. 1038—Brinell Hardness 179-229
Tools	Wesson 6" and 8" dia. Milling Cutters—fine pitch—inserted blade
Speed	8"—387 S.F.M. 6"—290 S.F.M.
Feed	14" per minute
Production	150 pcs. per hour 1500-1700 pcs. per grind
Grade of Carbide	Wessonmetal WM

SAVINGS OF OVER $14,225 PER YEAR ON ONE MACHINE WITH ONE SET OF WESSON TOOLS

OLD METHOD	NEW WESSON ENGINEERED METHOD
Cost 1 set Inserted Blades.....$48.00	Cost 1 set Inserted Blades.....$54.60
Pieces per Grind.....275	Pieces per Grind.....1600
Grinding Hours per year.....10,300	Grinding Hours per year.....2500
5 Machines Running 3 Shifts	3 Machines Running 2 Shifts
Machine Repair per year.....$25,000	Machine Repair per year.....$1200
Tool Cost per Piece.....$.00545*	Tool Cost per Piece.....$.00213*

(Machine repair and grinding costs not included)

HOW IS YOUR PRODUCTION SCORE CARD!



Write today for folder on Wesson's educational, full color, sound movie — "This Carbide Age."

Call Your
WESSON SERVICE ENGINEER—

WESSONMETAL Cemented Carbide

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY
Affiliated with WESSON COMPANY, Detroit, Mich.

APEX - specialists in screwdriving

reach right into the tight spots

use an APEX extension . . . with APEX power bits

Apex extensions provide the extra length that makes it easy to drive screws in hard-to-reach places.

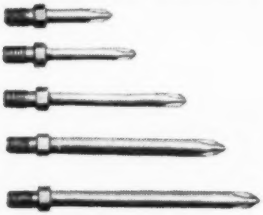
You can use them on any air, electric or spiral driver that accommodates ¼"-24 screw shank.

You can use them with any Apex ¼"-24 power bit or bit holder and insert bits.

You can use them in driving Phillips, Frearson (Reed & Prince), Slotted, Clutch Head, Socket Head (Allen type) or Hex Head screws.

In short, you can get the answer to just about any screwdriving problem from Apex. Write, on your company letterhead please, for your copy of our new Catalog 21 — the authority on screwdriving.

to drive PHILLIPS or FREARSON screws



to drive SLOTTED screws

to drive CLUTCH HEAD screws

to drive HEX HEAD screws

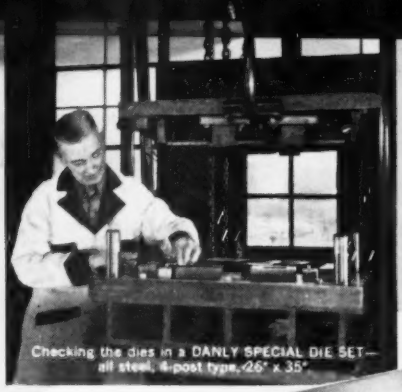
. . . with APEX bit holder and insert bits

APEX TOOLS

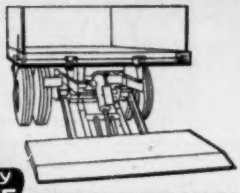
power bits, bit holders and insert bits

THE APEX MACHINE & TOOL COMPANY
1028 S. Patterson Blvd. • Dayton 2, Ohio

Power Bits, Insert Bits and Bit Holders, for Phillips, Frearson (Reed & Prince), Slotted, Clutch Head and Socket Head Screws • Hand Drivers for Phillips, Frearson and Clutch Head Screws • Two-Piece Drivers for Hex Head Screws • Sockets, Extensions, Adapters and Nut Setters • Universal Sockets, Extension Wrenches and Adapters • Aircraft and Industrial Universal Joints • Self-Releasing and Adjustable Stud Setters • Safety Friction Tapping Chucks • Vertical Float Tapping Chucks.



Checking the dies in a DANLY SPECIAL DIE SET—all steel, 4-post type, 26" x 35"



ANTHONY LIFT GATE HYDRAULIC

SHOWN IN LOADING POSITION

DANLY SPECIAL DIE SETS

View showing DANLY SPECIAL DIE SET during production run. Tail gate gussets are blanked and pierced in a single stage operation from 10 gage blue annealed sheet.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift!

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

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***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
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*Indicates complete stock

NIAGARA Presents

outstanding design features:

Double End Twin Drive with double reduction gearing (for straight bends and smooth power application.)

A rigid One-piece Frame with permanently welded crown for minimum deflection and permanent alignment.

Laminated Non-Metallic Ways maintain accurate alignment and assure longest life of dependable service.

Deep Twin Plate Steel Bed with open slug clearance for multiple punching work.

Powerful Air Cooled Friction Clutch and Brake assures easy ideal "Press Brake Action".

Air Electric Clutch Control may be operated by palm buttons on ram or foot switch with provisions for "Inching", "Single Stroking" and "Continuous Run".

Reversible Flywheel can be pulled out of accidental stalls.

Power Adjusted Ram with self-locking adjusting screws.

Micrometer Dials accurately indicate position of ram so die settings can be quickly repeated.

Accessibility at rear with plenty of clear working space for safety.

Gages with full horizontal and vertical adjustment for front or rear of press.

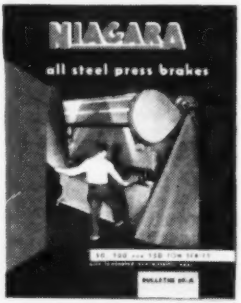
Angle Support Brackets and Bolster Plates quickly convert press for stamping operations without affecting bending ability.

All gears operate in totally enclosed sealed baths of oil.

versatility of operations

BENDING	JOGGLING
FORMING	NOTCHING
DRAWING	PUNCHING
BEADING	PIERCING
CURLING	PERFORATING
CORRUGATING	SLITTING
BLANKING	TRIMMING
EMBOSSING	ETC.

WRITE FOR BULLETIN 89



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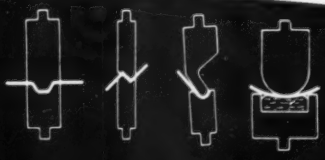
The Last Word in New All-Steel PRESS BRAKES

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK, PHILADELPHIA



America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

Dealers in principal U. S. cities and major foreign countries

CARBIDE WEAR LIFE
at Substantially Lower Cost
Because these parts are
Carb-O-Plated
Core rods and air gage mandrels are typical examples of parts which are now being Carb-O-Plated. Employing the "Linde" flame plating method, such parts receive a thin wear-resistant coating of tungsten carbide over the steel base.

With Carb-O-Plating the wear-resistant advantages of tungsten carbide are provided for parts which could not be produced from solid carbide or where, if the solid material was used, costs would be prohibitive.

In the case of core rods used in the powder metal industry, a part of the size illustrated would be highly expensive if produced of solid carbide. By Carb-O-Plating a steel core rod, an ideal combination of advantages is obtained—the part cost is low; the steel core provides toughness to resist shock; the tungsten carbide coating gives excellent wear resistance.

Parts such as the air gage mandrel shown could not be made of solid carbide because of machining problems to be encountered. Here Carb-O-Plating provides carbide life for all wearing surfaces. Carb-O-Plating may be the cost-saving answer for your wear-resistant parts. Let us send you full information.

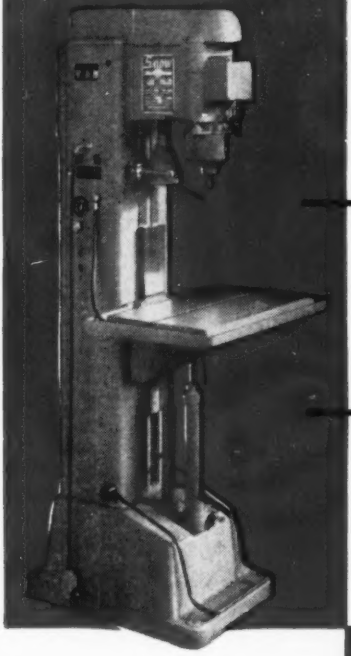
THE PLUS IN PRECISION

Lincoln Park **INDUSTRIES, INC.**

1719 FERRIS AVENUE, LINCOLN PARK 25, MICH.

DESIGNERS AND MANUFACTURERS OF: SPECIAL AND STANDARD CARBIDE CHROME PLATED AND STEEL GAGES CARBIDE ROTARY FILES • ALSO FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

For Top Production



SNOW

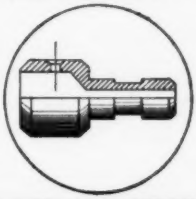
FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C"T" Sink 1/16" Hole

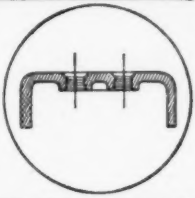
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING

Tap Two #10-32 Holes

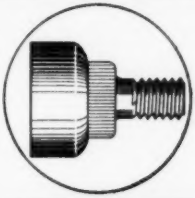
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long

Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW

MANUFACTURING COMPANY

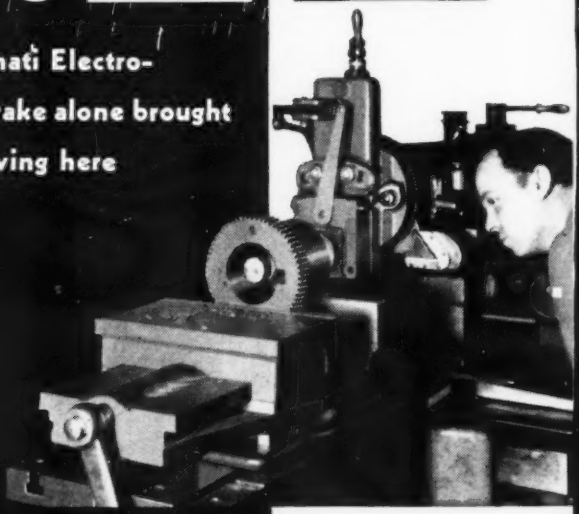
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

Outstanding Time Saver...

The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-5.

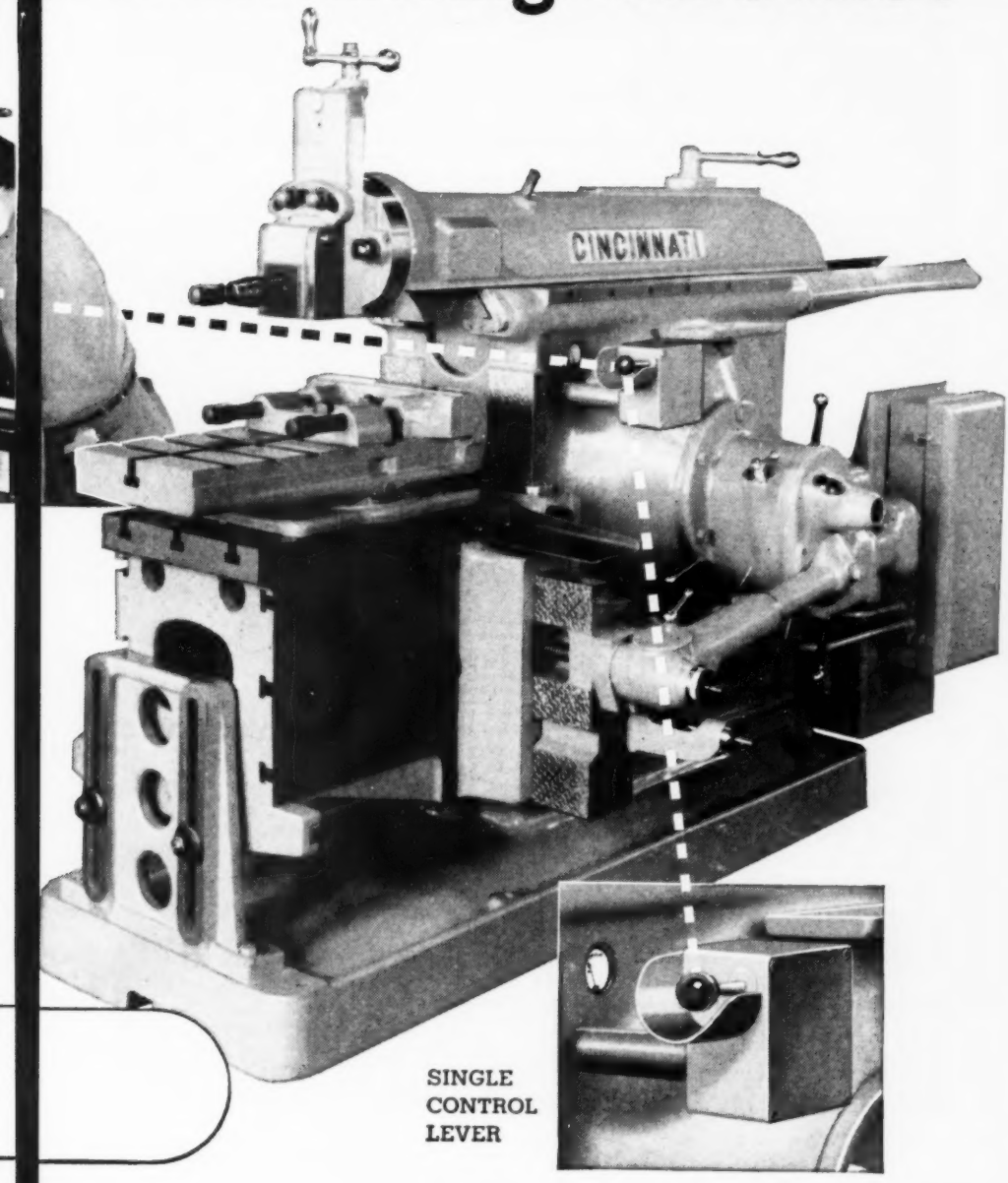
Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

...Outstanding ACCURACY



SINGLE
CONTROL
LEVER

- **TOOL ROOM SAVINGS and**
- **PRECISION PERFECTION *ASSURED***

with OLIVER ACE
Universal Tool and Cutter Grinders

Universally Acclaimed for—
Cost Cutting and
Extreme Accuracy

Oliver Ace Tool and Cutter Grinders make difficult jobs easy and economical . . . keep the most difficult cutters sharp. Check these Oliver Ace-High points of superiority:

✓	1. Direct reading for clearance reduces operator's fatigue . . . No Stoop, No Squat, No Squint. Requires no computation.
✓	2. Assures highest degree of accuracy.
✓	3. Built to give long-lasting service.
✓	4. Handles wide range of cutter grinding.
✓	5. Excels on high-speed and Tungsten-Carbide work.
✓	6. Dependable at all times.
✓	7. Requires fewer attachments than ordinary cutter grinders.
✓	8. Is faster on most grinding operations.
✓	9. Simple setup.
✓	10. Easy operation.

See our Catalog in Sweet's Directory

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.

2 MODELS: Standard and Heavy Duty (illustrated)
Write Today for Complete Data

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

OLIVER INSTRUMENT CO.
1408 E. MAUMEE • ADRIAN, MICHIGAN

for machining, grinding and presswork

A UNIVERSAL COOLANT-LUBRICANT

TOOL LIFE BOOSTED 60 to 80% WITH SHEAR-SPEED SOLUBLE OIL!

machine down-time cut in the production of gears for a large auto manufacturer.

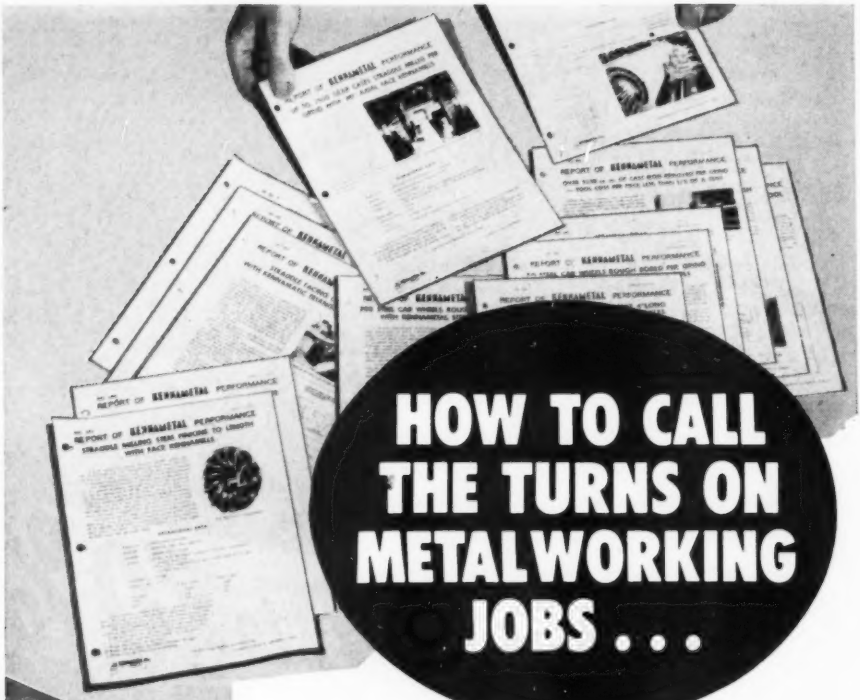
IMPARTIAL TESTS of two highly-rated cutting fluids vs. SHEAR-SPEED Soluble Oil were run under *exactly similar production conditions:* ***same machine, same parts, same cutting speed, same coolant flow, same tool grinding***

	Cutting Fluid X	Cutting Fluid Y	SHEAR-SPEED Soluble Oil	S/S Soluble Oil Gave This:
Average No. gears cut per grind	177.6	193	228	More pieces per grind
Tool stock removed per grind	.0227"	.0288"	.0188"	Less tool wear
No. of grinds per .375" hob wear	16	13	20	Longer tool life
Average tool life	2842 parts	2509 parts	4560 parts	Lower tool cost per piece

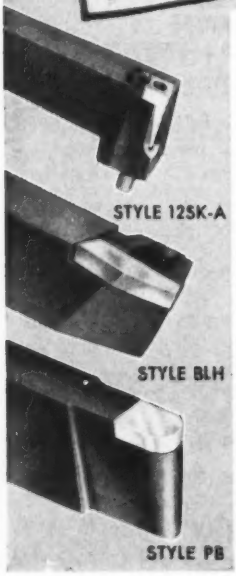
Convince yourself of the **amazing** advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a **satisfaction guaranteed** test basis. Write for **Bulletin SO-53** and price list.

SHEAR-SPEED CHEMICAL PRODUCTS

7175 E. McNICHOLS RD. *A Division of Michigan Tool Co.* DETROIT 12, MICH.



HOW TO CALL THE TURNS ON METALWORKING JOBS . . .



Ability to predict with a high degree of certainty the results obtainable from a cutting tool is a worthwhile asset—developed through knowledge and experience, acquired either firsthand or from other users of known repute.

It's a satisfaction to know beforehand that the tool chosen for a job will turn out well—has inherent properties that assure consistently good performance.

Foresighted metalworkers have learned to rely on Kennametal. It is noted for doing one good job after another, day in and day out, as demonstrated by scores of regularly-issued Performance Reports.

Our accumulated knowledge and experience on how to "call the turns" on a wide variety of applications is yours for the asking. Our Field Engineers will be glad to help you. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

Here's the tapping combination you asked for!

- **TAPPING MACHINE** — Foot or air operated for fastest operation with minimum effort. Built-in lubrication set-up for any tapping need.
- **TAPPING HEAD** — Five sizes of tapping attachments — or a wide range of fixed or adjustable multiple spindle tapping heads designed to your specifications — all interchangeable to meet different job requirements.
- **WORK HOLDER** — Engineered for fastest tapping and handling of the part.

Ettco-Emrick "UNIT ENGINEERED" 72A TAPPING MACHINE

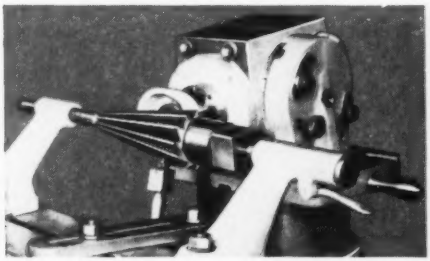
With this Ettco-Emrick tapping combination — a rigid, sensitive tapping machine — a built-for-the-purpose tapping head — and a custom-built work holder — you can do any tapping job faster, easier and more economically. Its low initial cost and accurate, high-speed work make it a worthwhile investment for any shop, whether for tapping a single hole or thirty holes.

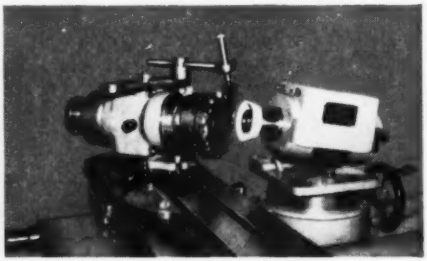
WRITE FOR BULLETIN NO. 72A
Ask your Ettco-Emrick distributor for a copy or write direct to us.

ETTCO TOOL CO., INC.
596 Johnson Avenue • Brooklyn 37, N. Y.

Specify THIS NEW POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane





TIME AND MONEY SAVING FEATURES:

1. Cup wheels, generally considered best for cutter grinding, can be used for practically all clearance angles on this new head.
2. Cup wheels produce a cutting edge on tools that lasts longer because it is stronger.
3. The tooth rest remains on the center line of the cutter for practically all grinding on centers or in the work head.
4. Most cutters and reamers can be ground all over with one set-up, using the swivelling table and Pope tilting head. The usual second and third set-ups are no longer required.
5. All clearance angles read directly in degrees from the scale provided on the head. Mistakes on clearance angles are avoided.
6. The right clearance angle is assured on tools difficult to grind, such as slab mills, taper reamers, angular cutters and form tools.
7. 3600 R.P.M. — one wheel speed — safe for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
8. The operating ease and convenience of this new Pope Head with the angular adjustment in the vertical plane saves you time and money on every tool you grind.

ASK FOR COMPLETE SPECIFICATIONS

No. 96

Specify **POPE** PRECISION SPINDLES

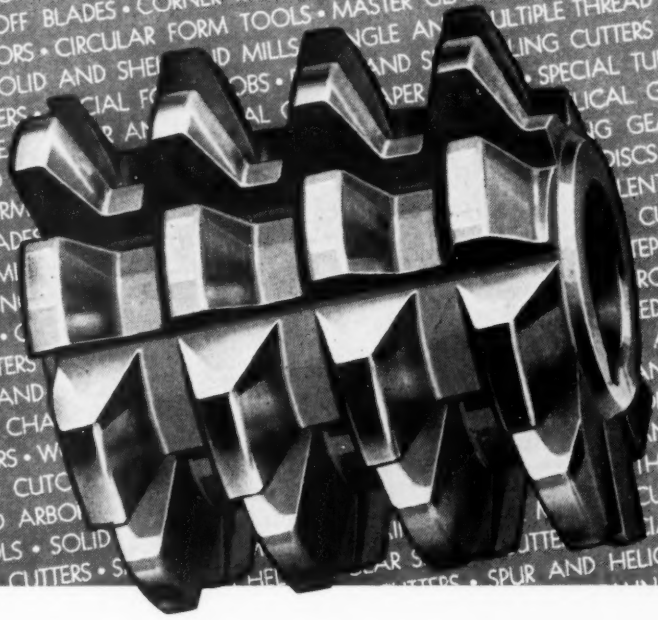
POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

FOR THOSE TOUGH Special JOBS
...DEPEND ON

National Tool Co.



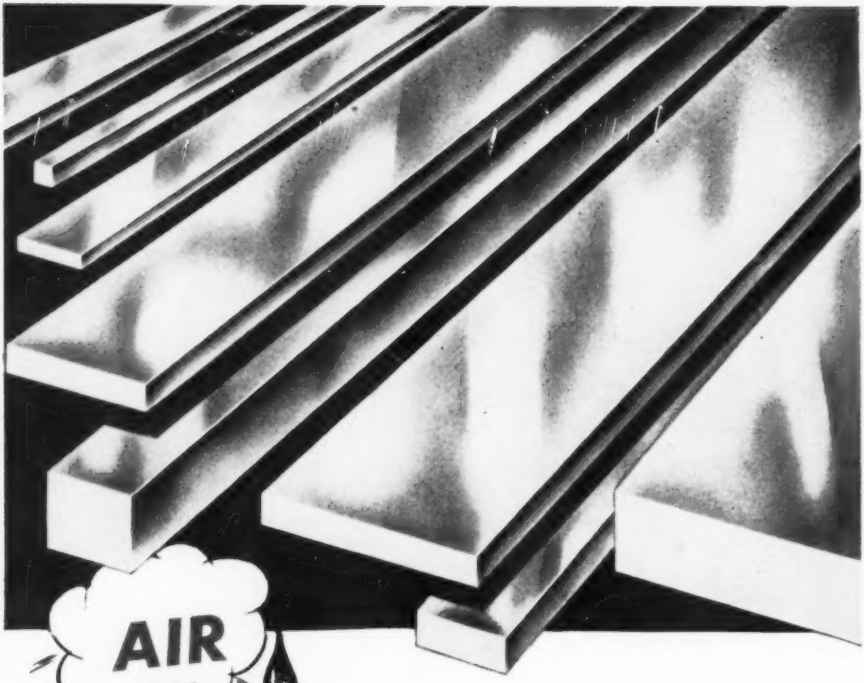
● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Representatives in major industrial centers.

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio



AIR or OIL HARDENING?... which DIE STEEL is best for you?

For punches and dies that produce up to 50% more pieces per sharpening — use *Simonds Air Hardening Die Steel.* 5% chrome content makes this non-deforming steel more wear-resistant. Better for punching or cutting silicon or stainless steels, Monel metal, or other abrasive metal. Spheroidize annealed for good machinability, it also has a wide hardening range (1700° to 1800°F). Stock sizes from ½" to 2" thick, and 2" to 10" wide in 36" lengths.

For standard die, jig, punch, gage and small tool applications, *Simonds Oil Hardening Flat Ground Die Steel* is a valuable time and money saver. Made of non-deforming molybdenum type die steel, it is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°F) good results are assured with even the simplest heat treating equipment. Stock sizes available from 1/64" to 3" thick and ⅛" to 14" wide in 18" lengths. Heavier sizes also furnished in 36" lengths.

Your Simonds Distributor stocks many sizes of both types . . . individually packaged with simple heat treating instructions. Call him for complete details.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

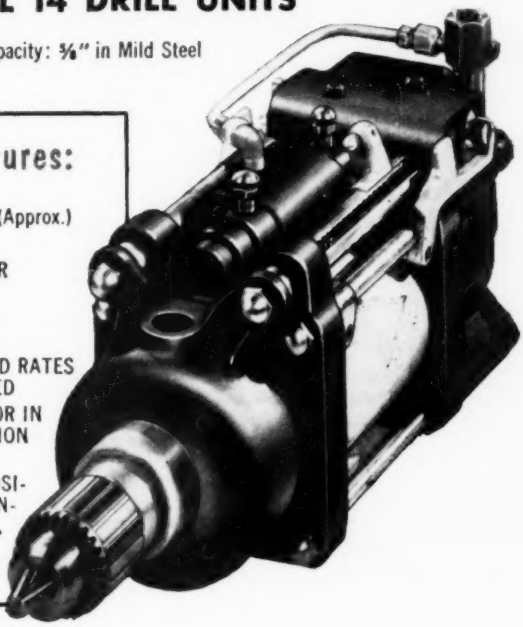
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Saw Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

LIGHT WEIGHT... EFFICIENT... FULLY AUTOMATIC

Air Actuated Hause Holomatic

MODEL 14 DRILL UNITS

Capacity: 5/8" in Mild Steel



Check These Features:

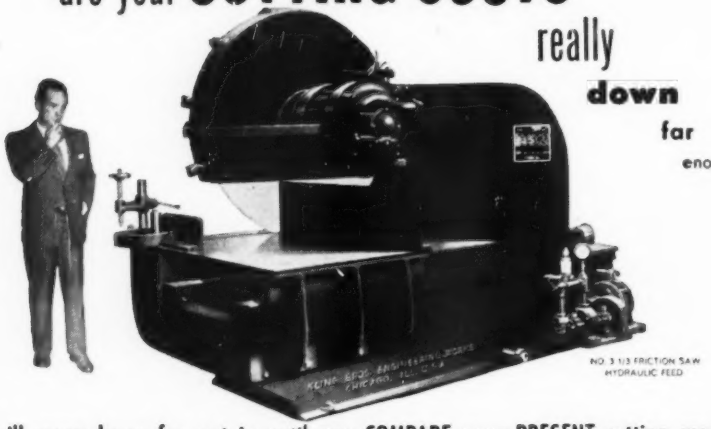
- ★ LIGHT WEIGHT ... WEIGHS ONLY 30 POUNDS (Approx.)
- ★ HYDRAULIC FEED
- ★ INFINITELY ADJUSTABLE FOR MULTIPLE FEED RATE JOBS
- ★ MANUAL OR CONTINUOUS AUTOMATIC CYCLING
- ★ ADVANCE AND RETRACT FEED RATES INDEPENDENTLY CONTROLLED
- ★ CAN BE MOUNTED SINGLY, OR IN GROUPS FOR HIGH PRODUCTION MACHINES
- ★ EASILY ADJUSTABLE FOR POSITIVE STOP ... DWELL ... INSTANTANEOUS RETRACT ... CONTINUOUS CYCLING ... JOGGING ... SKIP DRILLING.

WRITE FOR THE NEW BROCHURE

Hause ENGINEERING

MONTPELIER, OHIO

are your CUTTING COSTS really down far enough



you'll never know for certain until you COMPARE your PRESENT cutting speed with

the faster Kling *HIGH SPEED* FRICTION SAW!

What is friction sawing?
It is a proven means of using mechanical heat to cut steel. The weakened steel is removed by each succeeding section of the cooled saw blade—with no apparent wear on the blade.

Fastest, all-around cut-off machine in the shop.
No set-up changes required to cut any sequence of structural shapes. No distortion. One Kling Friction Saw will take the place of several separate shears or slow speed saws. Cuts alloy steels, too, in record time. Because blade life is measured in thousands of cuts, you eliminate downtime and save on tool costs.

Free friction sawing information. *Write today for free booklet on Friction Sawing. Learn how you can profitably apply Friction Sawing in your plant.*

KLING BROS. ENGINEERING WORKS
1323 N. Kostner Ave., Chicago 51, Illinois

How long would it take you to cut these pieces?	Cut it with a Kling in † . . .
24" 100 lb. I Beam	28 seconds
15" 55 lb. Channel	15 seconds
8" x 8" x 34.3 lb. H Beam	10 seconds
100 lb. A.R.A. Rail	9 seconds
6½" x 6½" x 19.8 lb. Tee	5 seconds
8" x 8" x ¾" Angle	11 seconds
3" Square	10 seconds
4" Round	15 seconds
6" O.D. Tube, ½" Wall	11 seconds

† Approximate Times

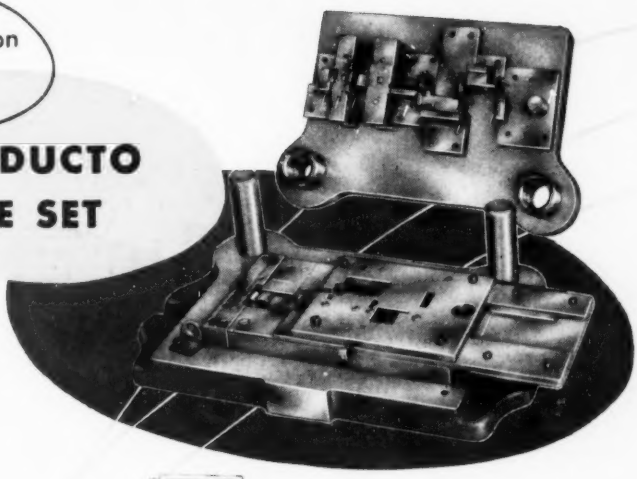
6008MMRR

Since 1892 **Kling** ***...an investment in speed!***

teamed precision of die and

PRODUCTO DIE SET

makes this intricate job possible



THE fuse terminal, shown below, is produced by the Federal Electric Products Co. for use in their Noark front operated safety switch. A Producto Die Set was selected to maintain the precise production of a top quality die at high speed operation.

Material is half hard 3/32" copper (Rockwell 30-40 B scale), automatically fed to a Niagara 40 ton press. The progressive die stations are 1) pierce and stamp, 2) notch, 3) lance and emboss, 4) form 5) finish form. Die is held to extremely close tolerances. Production: 4000 pieces (1-3/16" x 2-1/8") per hour, 70,000 between grinds.

Today's production calls more than ever for quality control . . . which, in die work, necessitates the best in die sets. Call for Producto . . . and be sure!

the PRODUCTO MACHINE COMPANY
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BRIDGEPORT 1, CONNECTICUT

1PDES

ACCURATE AT ANY ANGLE

UNIVERSAL MILLING HEAD

Rugged, compact design and precision manufacturing combine to make the TREE Universal Milling Attachment accurate for milling, drilling or boring . . . **at any angle.** Heavy duty spindle enables ¾" collet capacity. Automatic collet closer. Power feed. Eight spindle speeds. Hardened and ground spindle and quill. Enclosed micrometer depth stop.

Write for free literature describing the MH-4 Milling Head illustrated, the TREE Taper Boring Tool, the 2UV Vertical Mill and other quality TREE Tools. . .

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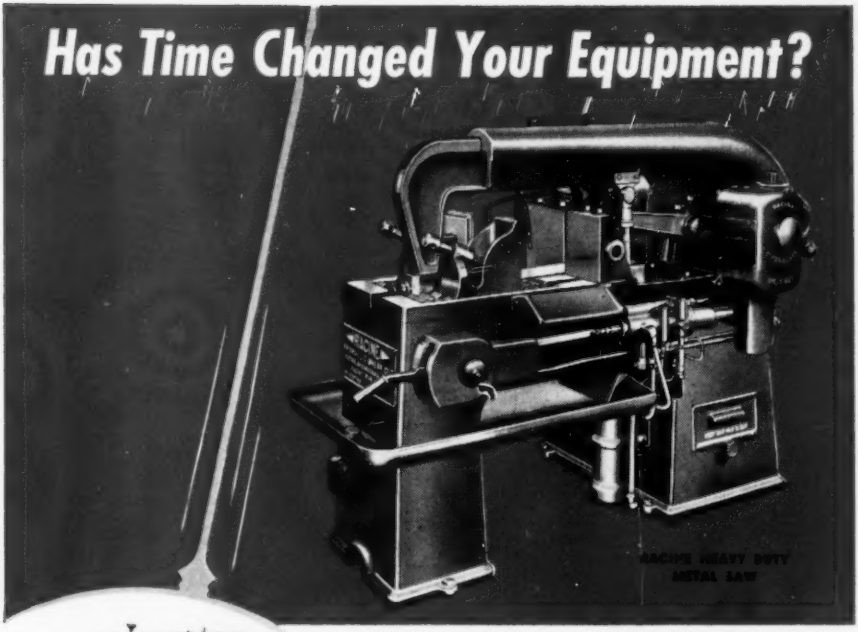
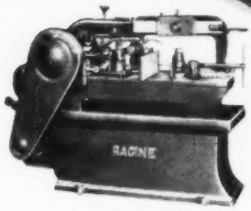
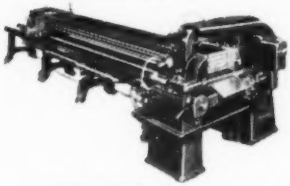
TREE TOOL AND DIE WORKS
1600 JUNCTION AVENUE RACINE, WISCONSIN

Has Time Changed Your Equipment?





RACINE "Utility" METAL SAW



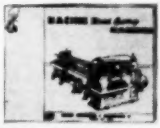
RACINE AUTOMATIC BAR FEED METAL CUTTING MACHINE

Why put up with the inaccuracy and slowness of aged metal cutting equipment. Step up your production, save material, reduce cut-off time and lessen subsequent machinery operations by installing a new modern Racine *all hydraulic* Metal Cutting Saw.

Racine Saws lower costs at the first stage in every metal working job — where the bar or billet is cut to size.

Available in a wide range of models for single purpose high speed or general all-around metal cutting work, and fully automatic bar feed units in sizes 6″ x 6″, to 20″ x 20″.

Don't wait — let us send a competent field engineer now. He will review your work and recommend cost-cutting steps. No obligation. Write for complete descriptive catalog. Address RACINE HYDRAULICS & MACHINERY, INC., 2070 Albert St., Racine, Wisc.



RACINE

HYDRAULICS & MACHINERY, INC.

RACINE, WISCONSIN

eliminate elaborate set-ups and operations

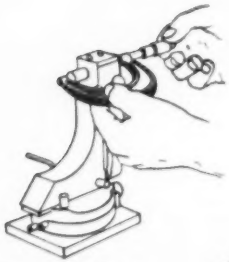
.0001" ACCURACY

Fluidmotion

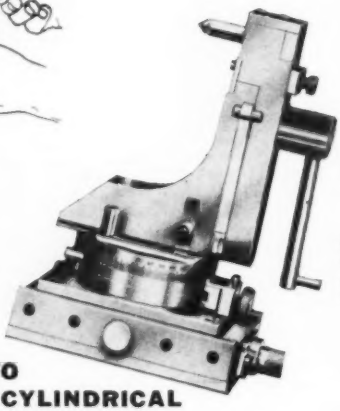
WHEEL DRESSERS

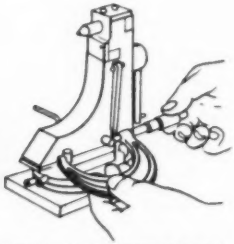
dress two angles tangent to a radius in one continuous motion

High-Carbon, High-Chrome Construction

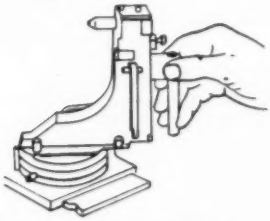


Step 1. Obtain micrometer reading as shown, and add required convex radius or subtract required concave radius.





Step 2. Next loosen gib with wrench and "mike" over lower pins to reading obtained in Step 1.



Step 3. Tighten gib; set stops for two angles; ready for action.

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the "Fluidmotion" Dresser, you can *dress* two angles *tangent* to a radius—using one handle *in one continuous motion.* Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

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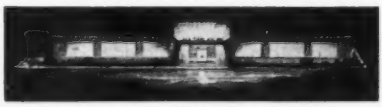
647 W. Mt. Pleasant Ave., Livingston, N.J.
(N. J. Highway Route No. 10)

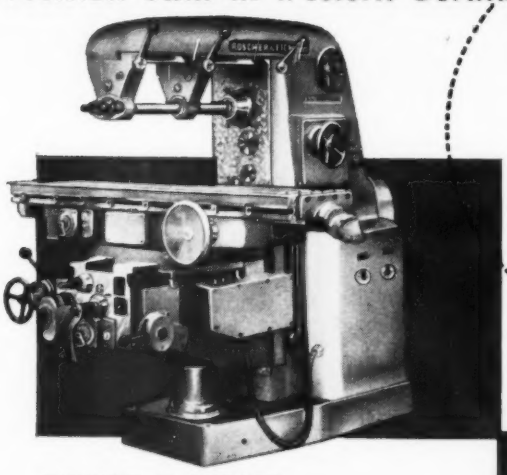


New home of J & S Tool Co., Inc.

J&S TOOL CO. INC.

A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.

Precision built in Western Germany . . .



OUTSTANDING MILLING MACHINES

With wide range of spindle speeds

Prices—Low

Delivery—Good

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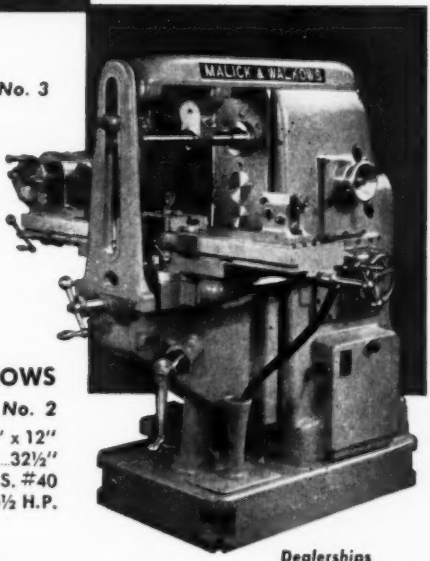
Heavy Duty Production Milling Machine No. 3

Plain & Universal

- Fully automatic cycle.
- Single lever control.
- Rapid traverse in all directions.
- Reciprocal milling and automatic spindle stop when in rapid traverse.
- Climb milling.
- Working surface 63" x 14".
- Longitudinal travel 48".
- Motor on spindle 11 HP.



MALICK & WALKOWS

Universal High Precision Milling Machine No. 2

Working surface	48" x 12"
Longitudinal travel	32½"
Working spindle	N.S. #40
Motor	5½ H.P.

All graduations in inches.

Spare parts and service available.

Both machines have vertical heads to be mounted on column, supported by ram and bearing, *as standard equipment.*

Dealerships are available in certain territories.

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Machine Tools Division

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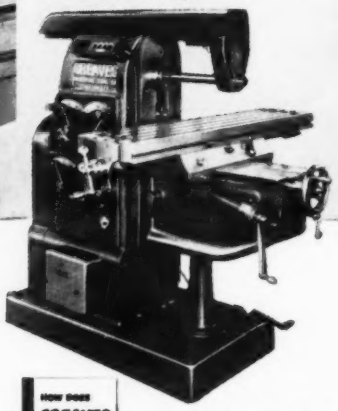
GREAVES

the BIGGEST VALUE in milling machines today!

Milling plastic mold block on Greaves 2H Universal milling machine using Greaves vertical milling attachment.



Greaves 2H Plain Milling Machine

Greaves gives top milling machine performance at bottom dollar costs

Greaves' wide speed and feed range, great power and substantial weight give it the capacity and performance usually found only in higher priced milling machines. The 2H has 18 spindle speeds from 25 to 1250 rpm, is powered by a 5-hp motor and weighs approximately 4,000 lbs (net weight plain model). Handles heavy duty production jobs as well as light milling in bronze and aluminum where the higher speeds and feeds are required.

Plain and universal models now equipped for climb milling. 18 feeds (½" to 30" per minute), hardened lapped alloy steel gears, Timken bearings, No. 50 National standard spindle nose, oil pump lubrication.

Send today for new chart showing how Greaves compares with other leading milling machines . . . how it can save money for you. Use coupon at right.

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CINCINNATI 2, OHIO, U. S. A.
Established 1917 Division J. A. Fay & Egan Co.

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Please send me chart comparing the 8 leading U. S. milling machines for price, capacity, power and other significant specifications.

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Company _____

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from the W&B Complete Line

If you are production drilling non-ferrous metals, efficiency requires selection of proper speeds, feeds, and most of all, drills specifically applicable to the material. From the complete line of W & B drills you can select a drill for each non-ferrous metal, that is carefully designed to increase production and lower your cost per hole.

A typical W & B non-ferrous drill is the "Fastwist" type, which is recommended for high speed drilling of aluminum, magnesium, zinc, other die cast metals and metals of low tensile strength. For maximum results on individual non-ferrous drilling applications it will pay you to investigate the W & B drill designs available.

Write today on your letterhead for a free copy of the new catalog covering the complete line of W & B Drills, Reamers, Countersinks, Counterbores, Carbide Tools, Tool Bits and Special Tools.

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We Know It's Hard to Believe- But It's True!

You Can Reduce Tap Costs Up to 75% with the BPS* SYSTEM OF TAP SHARPENING

Reduction of tap costs by as much as 50 to 75% — and more — is reported by leading metalworking firms using the B.P.S.* System. Why not get the same benefits?

HERE IS THE B.P.S.* SYSTEM:

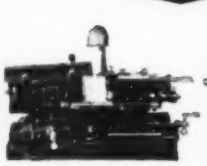
Adopt these two simple ideas: (1) Sharpen your taps at *regular, planned* intervals and (2) Sharpen flutes and chamfers of taps to an exceptionally high degree of accuracy (possible only on Blake grinders).

HERE'S HOW THE B.P.S.* SYSTEM CUTS YOUR COSTS:

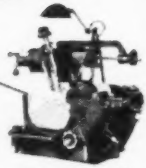
With the Blake Chamfer Grinder and Blake Flute Grinder, your operators can sharpen each tap precisely to correct any error in indexing and control the rake angle. Each tap then cuts much more accurately, more uniformly, with less strain — and its working life is greatly increased. Longer life, due to this superior sharpening method, gives far more service from every tap — greatly reduces tap costs!

*Blake Precision Sharpening

HERE'S WHAT THE B.P.S.* SYSTEM CAN DO FOR YOU!



BLAKE CHAMFER GRINDER



BLAKE FLUTE GRINDER

- Gives much more production per tap!
- Greatly reduces tap costs!
- Provides greater tap accuracy and uniformity!
- Greatly reduces tap breakage and spoiled or unacceptable work!

INVESTIGATE THE B.P.S.* SYSTEM NOW!

Write us for reprints of *American Machinist* and *Machinery* articles on this subject. Descriptive folders on both Blake grinders also available.

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Black Diamond Precision Drill Grinders • Waltham Cutter Sharpeners • Surface Finish Standards

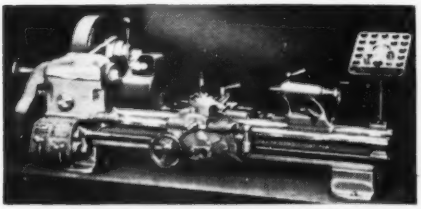
STEP-UP Your Light Precision Machining with LIGHT TEN LATHES

Here is a whole series of small lathes designed and built to do your light precision machining. All have the same sturdy construction, the same convenience and ease of operation. Send for complete catalog and select the lathe which exactly suits your needs.

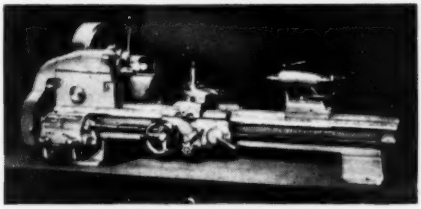
SPECIFICATIONS

Swing — 10" over bed
Collet Capacity — 5/8" max.
Spindle Bore — 27/32"
Distances Between Centers 16 1/8" to 34 1/8" max.
Spindle Speeds (approx.) 12-speed drives — 48 to 1435 r.p.m. 16-speed drives — 52 to 1365 r.p.m.
Power Longitudinal Feeds Toolroom and Model A — 48, .0015" to .0853". Model B — 26, .0021" to .0155". Model C — 14, .0021" to .0156".
Power Cross Feeds Toolroom and Model A — 48, .0004" to .0255". Model B — 23, .0009" to .0046". Model C — manual

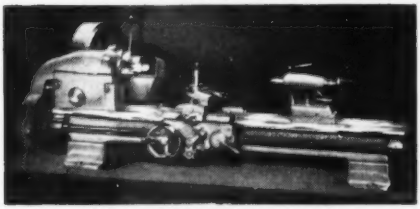
Light Ten Floor Lathe — Model A
Quick Change Gears — Universal Apron



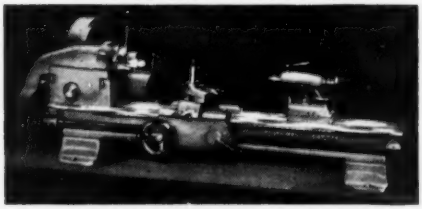
Light Ten Toolroom Precision Bench Lathe
Includes usual toolroom attachments



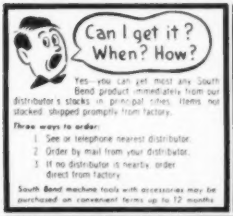
Light Ten Bench Lathe — Model A
Quick Change Gears — Universal Apron



Light Ten Bench Lathe — Model B
Independent Change Gears — Universal Apron



Light Ten Bench Lathe — Model C
Independent Change Gears — Plain Apron



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Three ways to order:
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2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

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☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ TOOL GRINDERS

☐ ½" & 1" Collet TURRET LATHES

☐ 7" BENCH SHAPERS

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(ANSWER NUMBER 3)

UNBIASED RECOMMENDATIONS

Producing *tools* and *tool materials* for the cutting, shaping and forming of metals is *major* business at Firth Sterling. Hence, capacity to serve you best necessarily embraces "full line tooling" . . . high speed tool steels *and* tungsten carbides, or *both* as needed.

So, you can count on *unbiased* tooling recommendations when you make Firth Sterling your *one* source of supply for *complete* shop tooling needs. We have no axes to grind!

What are the advantages to you?

1. An integrated tooling program that saves you money by matching tools to applications, without temptation to apply more expensive tools than may be necessary.

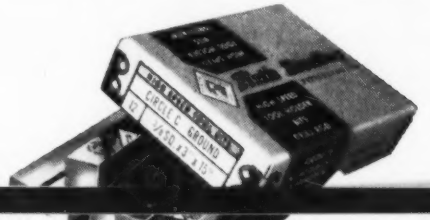
2. Improved production from wider selections. A choice

GET THE FIRTH STERLING *"Packaged Line"* FOR COMPLETE SHOP TOOLING

If they were jewels, instead of tools, they couldn't be packaged with more thought for distributors' and users' needs. Tough, corner-reinforced cardboard or reusable

Standard Firthite Carbide Tools

plastic containers for maximum protection. End or top marked with contents for quick, accurate selection. Boxed in standard quantities. Easy to handle,



2. Improved production from wider selections. A choice

die steels *and* a dozen grades of carbides in everything from die nibs to an almost unlimited selection of standard and special carbide tools and tips.

3. The purchasing economies inherent to buying from one source of supply instead of from several.
4. The finest "packaged" tool line today for easy handling, stocking, identification in the tool crib, and inventory control.
5. The consistently high quality assured by 64 years of leadership in development of special purpose steels and 21 years of pioneering in carbide and powder metallurgy applications.

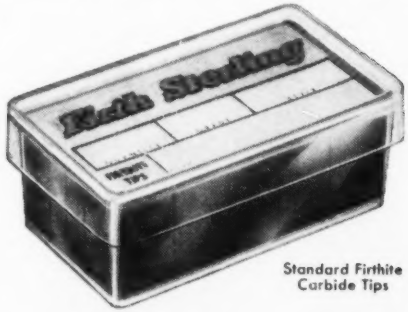
Makes sense, doesn't it? Call a Firth Sterling representative, or phone the nearest one of our 87 distributors.

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

I-3

High Speed Steel Tool Bits

stock, identify, inventory. Yes, the Firth Sterling packaged tool line has these advantages for distributor and user alike.



Standard Firthite Carbide Tips

But more, both high speed *steel* and Firthite *carbide* tools are available, to assure choice of the right tools for every job . . . from stock, from *one* dependable source!

P-2

Firth Sterling

— INC. —

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON*

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

VISIT BOOTH 912, METAL SHOW, CLEVELAND

Don't *tell* him,
Mr. Anderson . . . . . *show* him!

That new man in the shop, Mr. Anderson, will ask a lot of questions about taps and tapping results. But we know, and you know, that *showing* not *telling*, is the proof of "*performance-ability.*" Show him what Hanson-Whitney taps are doing . . . point out their complete dependability in day-in, day-out production. Then, like you, he'll be sold on . . .

Hanson-Whitney.....

The Hanson Process is the original method of *finishing after hardening* Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps to the complete satisfaction of our customers. We have *never* manufactured cut thread or unfinished taps in our years of serving the metalworking industry.

Yes, Mr. Anderson, the proven performance of Hanson-Whitney taps is a matter of record. Naturally, the right tap for the specific job is essential . . . ask the Hanson-Whitney representative for recommendations.

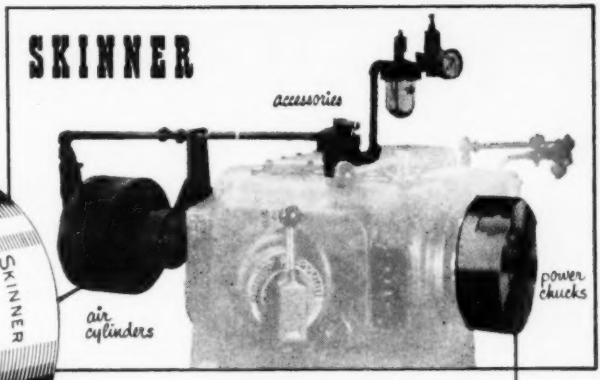
HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.
160 Bartholomew Avenue, Hartford, Connecticut, U. S. A.

Our "Mr. Anderson" typifies the thousands of practical machinists in America. You'll find him in your shop. Ask him what he thinks about H-W taps and gages.

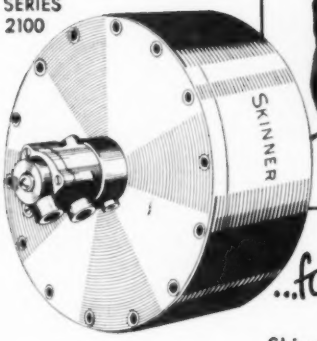
the **HANSON**
Threading Processes
Offer Complete
Coordinated
Responsibility
for
The Machine Tools
The Cutting Tools
The Measuring Gages

OHWB30

SKINNER



SERIES 2100

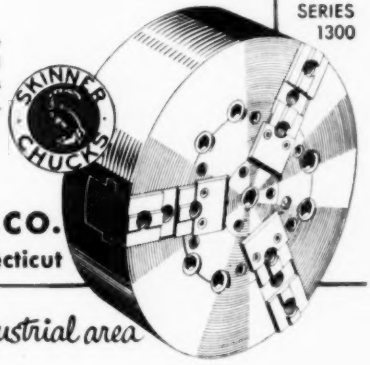


...for every high production need!

Skinner Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively, and will not release the work, even if air line is broken, until operator actuates draw bar. Double-acting rotating (Series 2100 for speeds up to 1500 R.P.M.) and non-rotating air cylinders are available with semi-steel bodies for all sizes of power chucks, holding fixtures and tailstocks. Series 2200 double-acting rotating air cylinders have aluminum bodies for operation up to 3000 spindle R.P.M. Skinner accessories include hand-operating valves—complete air unit—filters—soft blank top jaws; draw bars—draw tubes, etc.

Write for catalog on the Skinner line of power and manually operated chucks. And ask about movie, "Chucks and Their Uses"—available for free showings.

SERIES 1300



THE SKINNER CHUCK CO.

207 Edgewood Ave., New Britain, Connecticut

Sold by leading distributors in every industrial area

$125.00

Complete, Ready to Install and Plug In

MOTOR:
1/15 hp, 110 V. AC 60 Cycle

MECHANISM:
Bronze Gear, Steel Worm

WEIGHT:
Approximately 10 lbs., Net

DIMENSIONS:
4½" x 5½" x 8", less connecting shaft.

Four speeds in either direction! 1.2, 2.1, 3.2, and 4.5 inches of table travel per minute... all independent of spindle speed and direction of rotation.

Powerful! Table drive equals or exceeds milling capacity of the spindle.

Table travel instantly reversible! Reversible motor and simple two-way switch instantly reverses direction of table feed. Adjustable stops limit table travel in either direction.

Doesn't interfere with manual operation! Lever quickly disengages worm gear drive, permitting use of ordinary hand feeds when desired!

Easily installed in 10-15 minutes! Two bolts secure unit to end of table on any hand-screw model. Slots in adapter permit easy alignment with lead screw, eliminate fussy hole location.

(Note—not adaptable to production models with rack and pinion table feed.)

Available factory-installed on all new Benchmaster Mills, or as an accessory for all Benchmasters now in use!

See your Benchmaster dealer today!

Benchmaster
Manufacturing Co.
1835 W. Rosecrans Avenue
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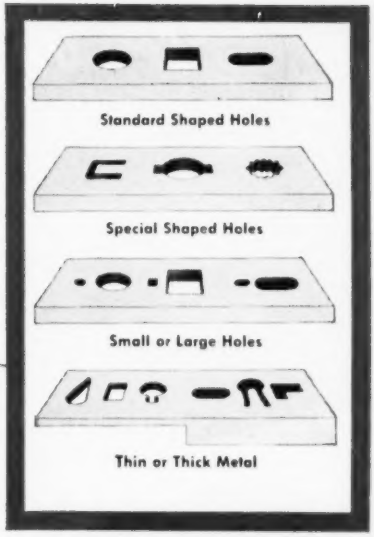
World's largest manufacturer of small punch presses and mills.

WHEN R-B Punches Are Used



What are your piercing or forming requirements—standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? There is either an R-B punch in standard shapes and sizes or R-B will manufacture special punches, die buttons and retainers to your specifications that will provide more efficient piercing operations.

Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

R-B Engineering Service Is Available for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
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SPEEDS UP

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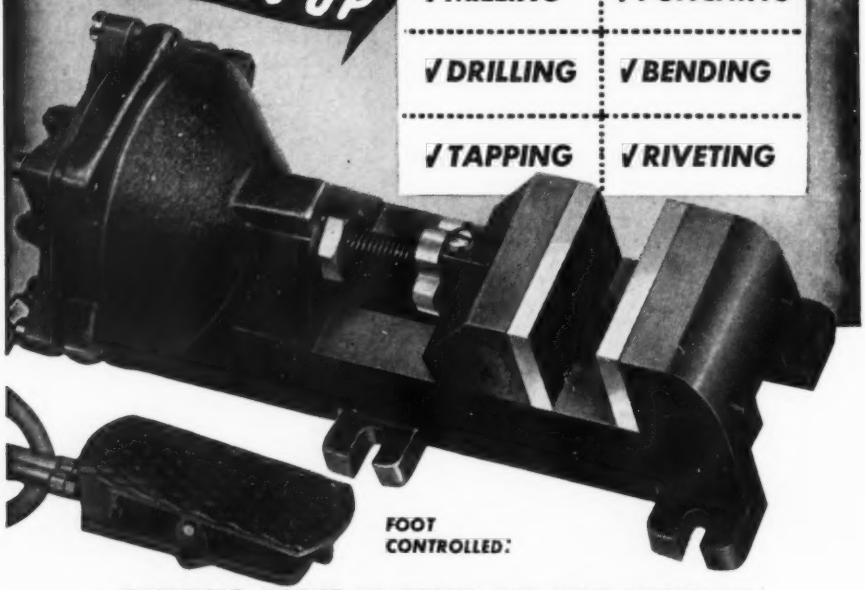

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Speedy Air Vise helps you do dozens of operations faster, better, cheaper—by air pressure! Foot control valve opens and shuts vise instantly, leaving *both* hands free to produce *more!* Jaw opens up to 3 inches, holds castings, parts, jigs, etc. Compact, trouble-free, inexpensive.
Complete with Foot Control Valve, Air Hose and Fittings . . only **$36.00**

ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT

AIR REGULATOR
Precision-built. Delivers pressures up to 140 lbs. With gauge, $5.95 Less gauge, $3.25

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Keeps water and particles out of the regulator and pneumatic tools. $3.00

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Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . . $3.00

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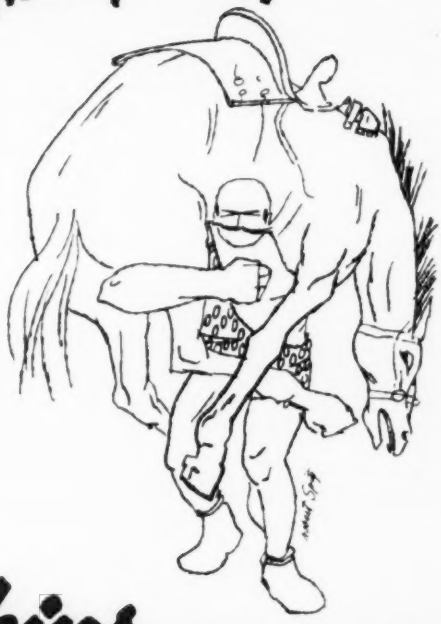

USE **haskins** FLEXIBLE SHAFT TOOLS

FOR ALL *grinding · sanding · filing · polishing*

Why burden skilled hands with the chore of manhandling bulky, heavy, conventional grinders? Haskins flexible shaft equipment furnishes all the power required for the job—without the weight. And the Haskins line includes models with horsepowers, speeds, tools and attachments that will exactly suit your job. Write for the latest catalog which describes all models.

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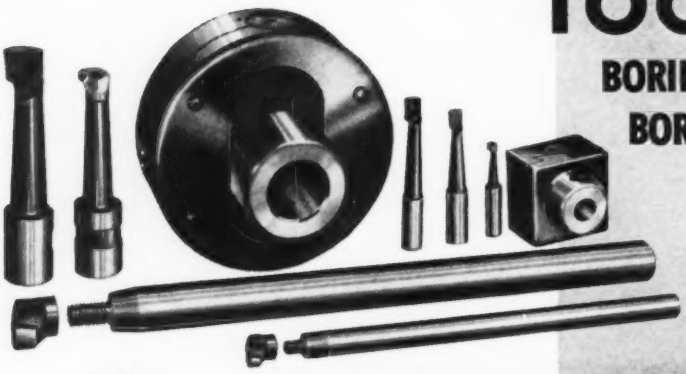
R. G. HASKINS COMPANY

2645 W. Harrison Street · Chicago 12, Ill.

for more *Accurate* cuts...
greater *Rigidity* in

BORING TOOLS

BORING HEADS
BORING BARS



Use CRITERION BORING EQUIPMENT

BORING PROBLEMS? CLOSE TOLERANCE?

Try Criterion Boring Tools. Built with the same care and quality as the time-tested Criterion Boring Head.

THIS COMBINATION WILL PRODUCE RESULTS.

Boring heads from 1½ to 7 inch diameter. Boring tools, carbide or high speed steel, ⅜ to 1¾ inches diameter. Bore holes from ⅛ to 20 inch diameter.

Accuracy for the closest tolerance • Rigidity for the heavy cuts • Heat-treated parts for long wear

LARGE OFFSET SAVES TIME AND TOOL CHANGES

These tools will cut your boring costs.
See the complete line of CRITERION TOOL PRODUCTS at your local dealers or write for free catalog.

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MACHINE WORKS
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JOIN INDUSTRIAL AMERICA—

Heat Treat High Speed Steel

The SENTRY Way!

"ALWAYS ON DUTY"

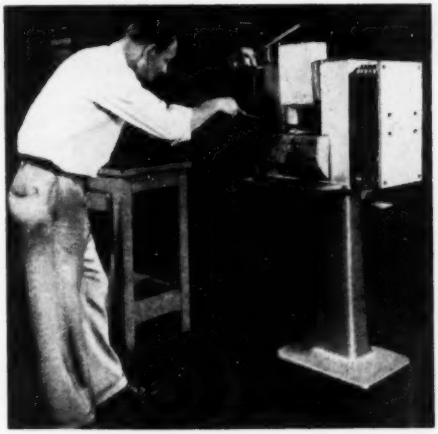
SENTRY MODEL YP Vertical model for long, slender drills, reamers broaches, etc.

SENTRY MODEL 2Y For small tools, cutters of moly, tungsten and cobalt high speed steels.

Sentry Delivers Precision Heat Treating at HAMILTON WATCH

The Sentry installation at Hamilton Watch Company's Lancaster, Pennsylvania, plant makes possible precision heat treating of high speed steel . . . including mills, miniature form cutters, reamers, and drills as small as .0065". Some high alloy tools and watch parts, requiring high temperature heat treating, are hardened in Hamilton's Sentry furnace.

Hamilton's research technicians make frequent use of the Sentry furnace to test new production on tools made from various experimental high speed alloys.



Sentry 5Y Installation at Hamilton Watch Co., Lancaster, Pennsylvania

REQUEST CATALOG H-2

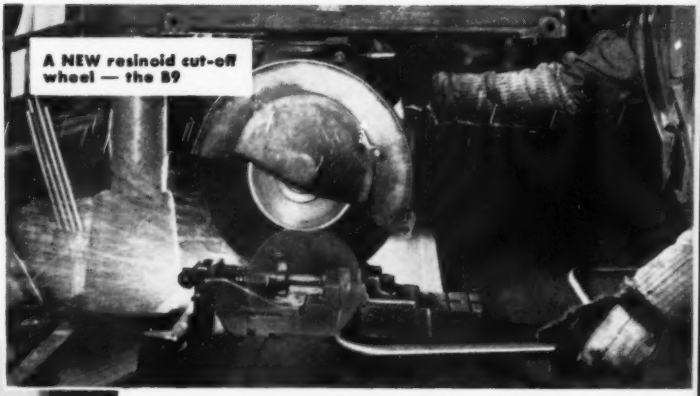
DIAMOND BRAND

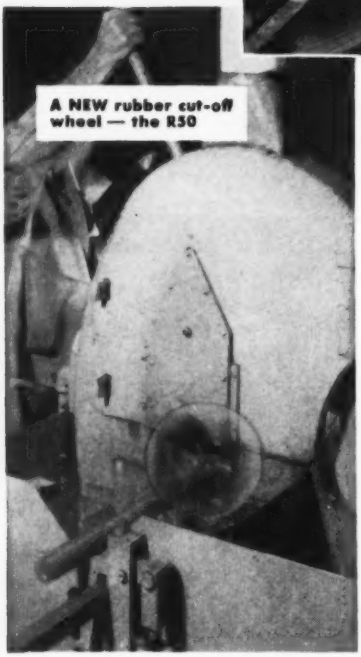
THE SENTRY COMPANY

FOXBORO, MASSACHUSETTS

INDUSTRIAL ELECTRIC FURNACES AND EQUIPMENT FOR HEAT TREATMENT OF METALS

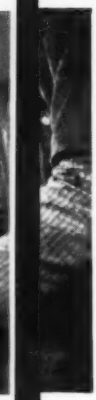
For high production — The new Norton B9 resinoid bonded cut-off wheel cuts free and cool at speeds up to 16,000 surface feet per minute. An exceptional performer on both ferrous and non-ferrous metals.





Where clearance counts — The new Norton R50 rubber bonded cut-off wheel has the unusual advantage of built-in chip clearance. Ideal for wet-cutting of ferrous or non-ferrous bar stock, in diameters up to 6".

Stronger, safer, more versatile — The popular Norton BN cut-off wheel, resinoid bonded, is used on all types of machines for the widest variety of metallic and non-metallic applications.



Cost-cutters for cutting-off!

Norton wheels bring the "TOUCH of GOLD" to every job

Each type of cut-off wheel in the broad Norton line has individual features for top efficiency and economy in its particular job range. For example:

The new Norton B9 resinoid bonded cut-off wheel is made with either smooth sides or the rougher "F" sides, for more clearance. A high production wheel, the B9 cuts free and cool, with a minimum of burning and will give you long, money-saving service in the widest range of metal-cutting applications.

The new Norton R50 cut-off wheel, rubber bonded, is designed especially for wet-cutting of bar stock up to 6" diameter. Built-in chip clearance is an advantage that helps assure freer, faster cutting with maximum service life.

Long a great favorite for metallic and non-metallic cut-off jobs, the resinoid bonded BN wheel features versatility and safety. On all types of machines — on jobs ranging from cutting tile to track slotting — the BN delivers up to six times longer wheel life, with breakage practically eliminated.

Other outstanding Norton cut-off wheels: the resinoid bonded B2, a valuable tool room wheel and also widely used on non-metallic materials; the rubber bonded R30 for small diameter work and fine slotting; and the highly durable, rubber bonded R20 that resists severest dressing action.

Ask your Norton distributor about the correct Norton cut-off wheels, in ALUNDUM* abrasive or CRYSTOLON* abrasive, for your materials and machines. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W—1516

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ABRASIVES

Making better products . . . to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

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COOL TOOLS BEST WITH "FULFLO"
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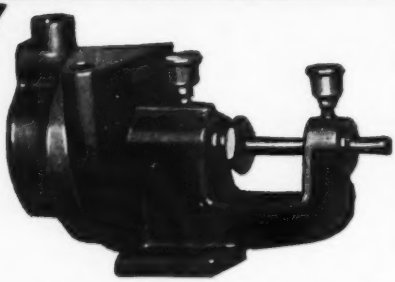


MODEL PRS4
Right rotation

MODEL PLS4
Left Rotation

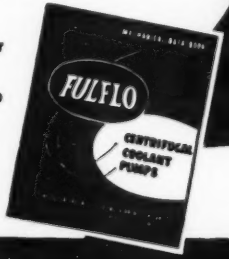
Direction connection;
1800 to 2600 rpm.
3½ to 5 gal per min.

Pipe sizes: ⅜" to 1½"

HERE'S WHY FULFLO PUMPS BELONG ON YOUR EQUIPMENT:

- **constant pumping action**
- **chips or grit do not interfere**
- **spring tension packing prevents leaks**
- **no bearing in pump to wear out**
- **pump shaft replaced easily**
- **carbon seal, if desired**
- **automatic adjustment**
- **right or left rotation**
- **self-contained priming chamber**

Direct or motor drive
Capacities: ¼ hp 25 gpm to 1 hp 90 gpm



WRITE TODAY (on your letterhead, please) for personal copy FULFLO MECHANICAL DATA BOOK. State if for Valves . . . for Pumps . . . or for both.

"FULFLO"

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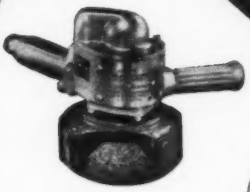
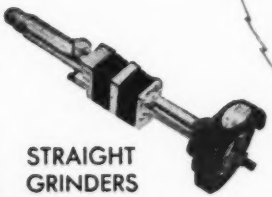


VERTICAL GRINDERS

HIGH CYCLE TOOLS

DIE GRINDERS

CONE GRINDERS



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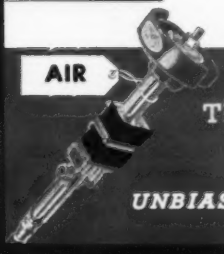
SCREW DRIVERS

● The past 25 years have established the reputation of Rotor Tool for "better portable tools for industry." Here are a few of Rotor's extensive line . . . produced in the industry's most modern air-conditioned plant for "tops in precision"... to help you get rock-bottom costs. Write for catalogs: Air Tools—No. 38; 180—Cycle Electric Tools—No. 34; 360—Cycle Electric Tools—No. 36.



AIR

HIGH CYCLE

THE ROTOR TOOL CO.

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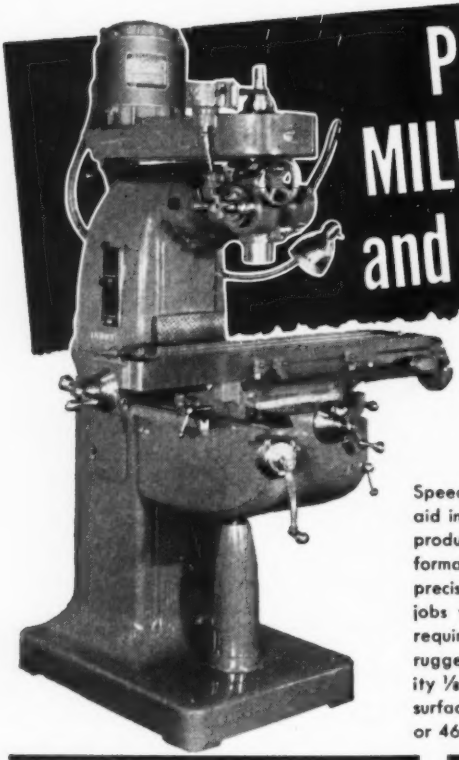
For PRECISION at Surprisingly LOW COST



Put All Your MILLING, BORING and DRILLING Jobs on INDEX MILLS

Speed up operations with INDEX MACHINES as an aid in meeting today's high pressure tool room and production plant service. They assure you peak performance while holding to the Index reputation of precision and economy . . . For those heavy-duty jobs where increased speed and feed range are required, you will find your answer in this strong, rugged MODEL 55 VERTICAL MILL (Pictured). Capacity ⅛" to 1½" end mills in steel and a table working surface of 32" x 9" or 38" x 9", Overall 40" x 9" or 46" x 9".

MODEL 40 VERTICAL MILL

A machine that emphasizes the combination of Precision, Production, and Economy . . . It embodies many features that provide for faster, more economical milling, resulting in a substantial cut in production costs . . . It is sufficiently rugged for day-to-day operation and can also be used for accurate boring and locating . . . Capacity ⅛" to 1" end mills in tool steel. Table working surface 8" x 26", 8" x 34" overall.

MODEL 60 HORIZONTAL MILL

A versatile machine with simplicity of design that permits an unusually low price while reflecting quality, accuracy and practical utility . . . A product where advanced engineering and expert craftsmanship have joined to bring out an outstanding piece of equipment adapted to tool room use, yet sufficiently rigid for the requirements of production shops . . . Standard table 40" x 9" with larger table optional. Equals or exceeds a light No. 2 in capacity.

INDEX BUILDS BETTER MILLS . . . WRITE FOR LITERATURE

INDEX MACHINE CO.

540 N. MECHANIC STREET JACKSON, MICHIGAN

EXTRA *inventory*

EXTRA *men*

EXTRA *service*

at no extra cost . . .

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SOCKET SCREW DEALER

Sure, you expect delivery and service from your industrial distributor, but you will find there's something EXTRA about the service from your Brighton Socket Screw Distributor—an extra interest in your fastener needs, extra desire and ability to fill those needs.

EXTRA INVENTORY—When you need socket screws, he has them or will get them quickly from centrally located factory stocks.

EXTRA SERVICE—When you need technical help on fasteners, he has at his disposal factory engineers, Brighton's field men, to help you.

EXTRA QUALITY—His line of Brighton Socket Screws is tops in quality, meeting the highest standards of strength, accuracy and uniformity.

Take advantage of all the EXTRAS your Brighton distributor offers. If you are not already acquainted, write for his name.

B-RIGHT-ON

THE BRIGHTON SCREW & MANUFACTURING COMPANY
1839 READING ROAD, CINCINNATI 2, OHIO

L&I's broader range of high quality STANDARD reamers has met with overwhelming acceptance. Ask your distributor for latest information on L&I's quality plus . . .

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MACHINE and TOOL BLUE BOOK

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OCTOBER, 1953

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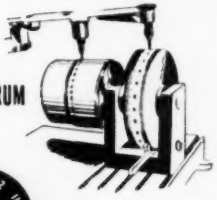
The Green Engraver

Used and endorsed by tool and die, electronic, machine, plastics, radio, electrical and instrument manufacturers.

A real money saver.

ENGRAVES
ROUTS
PROFILES
and MODELS

NUMBERED RING



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STENCIL

FREE: Brochure—
yours upon request.

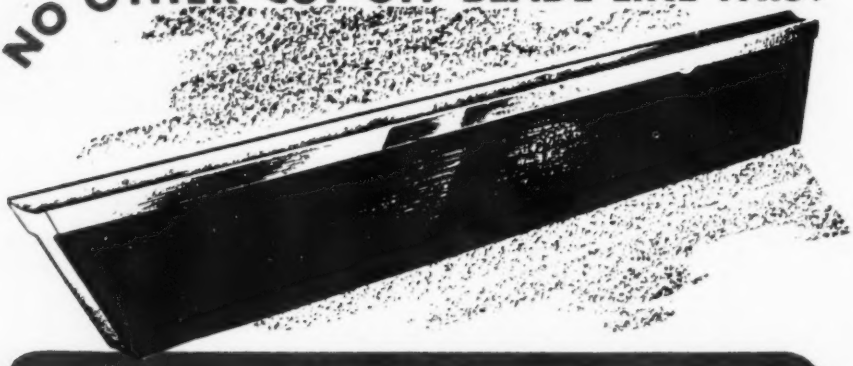
Special attachments and engineering service available for production work.

Specify the Green Engraver for precision engraving on metal, plastics, wood, glass, hard rubber etc. . . . engraves panels, name plates, scales, dials, molds, lenses, instruments, instruction plates, directional signs . . . by simple tracing from master. *Routing, profiling and three dimensional modeling indicate its versatility.* Electric etching attachment available.

Green Instrument Co.
INCORPORATED

386 PUTNAM AVENUE
CAMBRIDGE · MASS.

NO OTHER CUT-OFF BLADE LIKE THIS!



None can do what **EMPIRE'S**

Luers Cutting-off Blade

will do

Empire Tool Co. is the LEADER in cut-off blade developments—backed by twenty years' experience in cut-off blade manufacture.

Cut-off blades are tools subject to conditions different from those of other tools and will perform most efficiently only when specialists' recommendations are followed.

Available from stock are blades of four types of high speed steels developed to meet the demands of cut-off operations. And on short notice you can get blades of cast alloys and tungsten carbide.

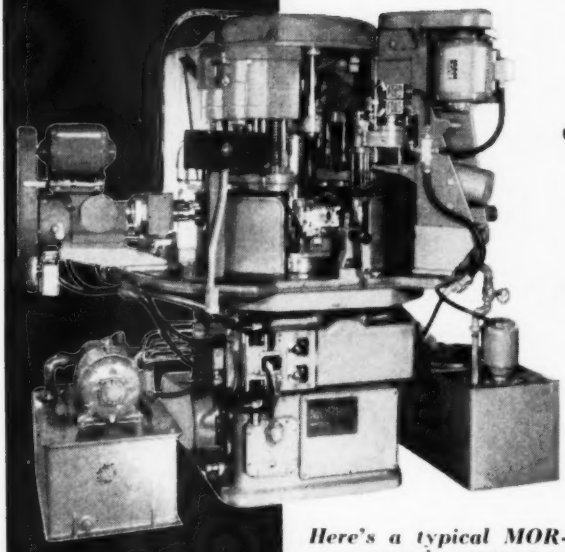
Made under license issued by John Milton Luers Patents, Inc.

Made in U.S.A.

EMPIRE TOOL COMPANY

8774 GRINNELL AVE. DETROIT 13, MICHIGAN

how little does it cost...



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

to get "special machine" production with combination standard units?

Here's a typical MOR-SPEED answer to an ever-more important problem:

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production and precision can be yours for less than you might imagine.

a better product at less cost with precision plus production

MOR-SPEED

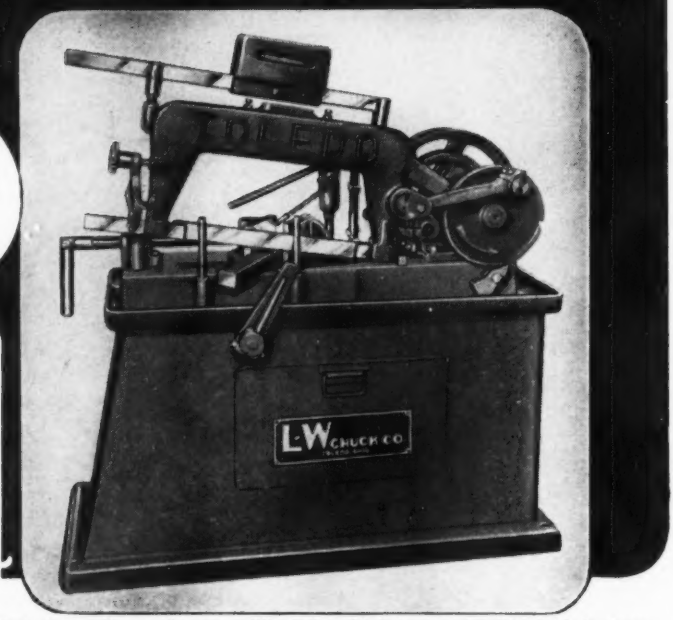
Morris

THE MORRIS MACHINE TOOL CO.
937 HARRIET ST.
CINCINNATI 3, OHIO

Everything You Want in a Good High Speed Saw at an Ever-So-Low Price!

L W POWER HACK SAWS

ONLY $297.56



Stops automatically on completion of cut. Automatic relief of saw blade on non-cutting stroke. 6" x 6" capacity using 10" x 14" blades. 12" x 3" clutch pulley. Pulley speed 120 r.p.m. Coolant pump base. Swivel vise for angle cuts. All steel welded base and table. V-belt drive. Rigid frame. Gravity feed. Length gauge. Expanding clutch. 3-speed (90 to 130 r.p.m.) V-belt motor drive arrangement. $32.21, less motors. ½ H.P. 1725 R.P.M. motor recommended. Completely motorized with switch; Single Phase $390.24; Three Phase $397.03.

IMMEDIATE DELIVERY — Order from your industrial supply distributor or order direct, giving name of your distributor.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 23 SO. ST. CLAIR ST. TOLEDO 4, OHIO

Rivett 918 "Steelway" Turret Lathe

Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

For here's a lathe that's been developed out of the bench class into a production machine. It has all the inherent precision for which Rivett has long been famous, plus time-saving features that reduce set-up and cutting operations to a fraction of that normally required. Single part production can be powered and cycled automatically.

Any one of 120 to 3750 RPM cutting speeds may be instantly and accurately selected; newly designed collets increase speed of operation as well as accuracy and gripping power; automatic chuck closer and well grouped controls step up operator time.

Bulletin 918ST will give you all the details. Write for your copy today.

RIVETT

LATHE & GRINDER, Inc.

Dept. MTBR 10 Brighton 35, Boston, Mass.

For more Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

SHARP PERMANENT MARKING
WITH HI-DUTY MARKING TOOLS

For legible permanent marking of metal components use GTS engraved lettering tools. Precision engraved dies and inserts for indenting or embossing identification on your parts will

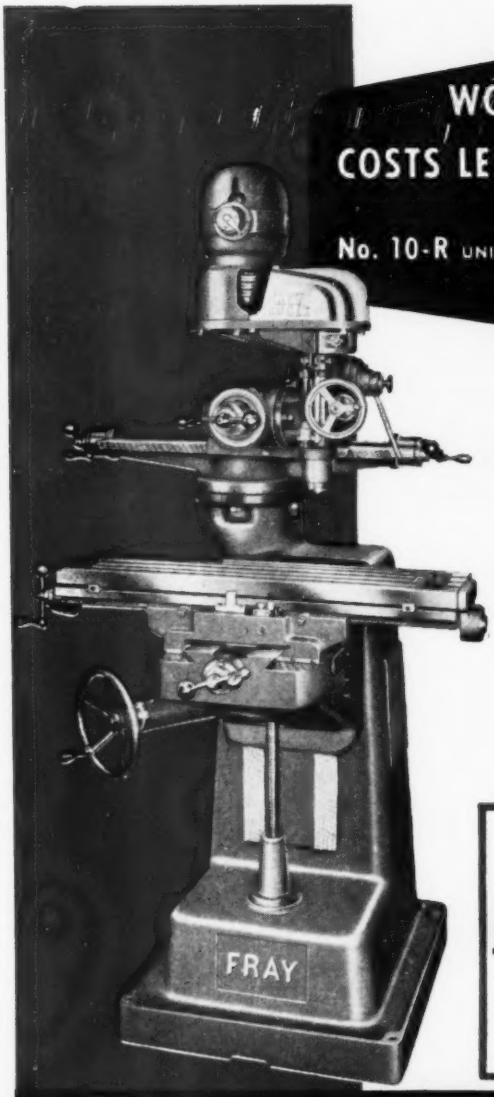
1. Improve appearance.
2. Advertise throughout life of part.
3. Facilitate reordering.

Write for free catalog on Production Marking Equipment.

COMPLETE MACHINE FACILITIES TO PRODUCE

- Hand Stamps
- Engraved Inserts for Dies
- Shank Style Stamping Dies
- Embossing Dies
- Code Stamps
- Steel Type
- Numbering Heads
- Marking Machines
- Nameplate Marking Equipment

GEO. T. SCHMIDT, INC.
1802 Belle Plaine Avenue
Chicago 13, Illinois



WORK MOVES FASTER
COSTS LESS with a Fray
No. 10-R UNIVERSAL RAM • TURRET TYPE • VERTICAL
MILLING MACHINE

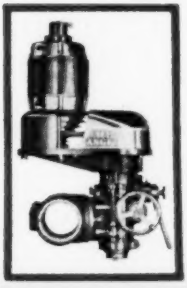
You get a wider work range than with any other machine this size. You can machine at any angle—vertical, horizontal or both. You can mill, drill or bore at any angle. Hence resetting isn't necessary. Just change the machine—changing is quick. (For vertical and regular horizontal milling, use the 10-RH.) Jobs are done faster and better . . . at less cost. • It's Universal • Rugged • Easy to Operate.

A high precision tool.

Write for details and specifications.

Bulletin 10.

FRAY "ALL-ANGLE" HEAD TYPE 4



For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.

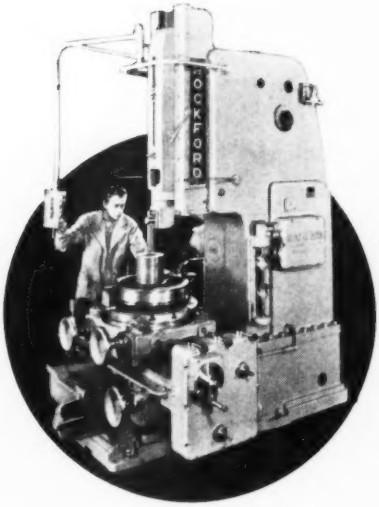
All-Angle

FRAY MACHINE TOOL CO.

hydraulic drive...a natural for

Rockford Machine Tool Co.

reciprocating machine tools



Hydraulic Drive and Feeds, as basic features in modern machine tool design, provide outstanding performance, measured in terms of work quality, high production and low operating cost.
We have had over 25 years of experience in applying Hydraulic Drives and Feeds to Shapers, Planers and Slotters.

rockford hydraulic slotters

Powerful Hydraulic Fulcrum Drive to Ram
10° Tilt to Ram
Swiveling Tool Head
Pendant Controlled Cutting Speed Changes, infinitely variable.
Hydraulic Feeds in all Directions
Power Rapid Traverse in all Directions
Stroke Length Adjustment when Ram is in motion.
Dividing Head, Standard Equipment
Optional—Traveling Column for Greater Capacity

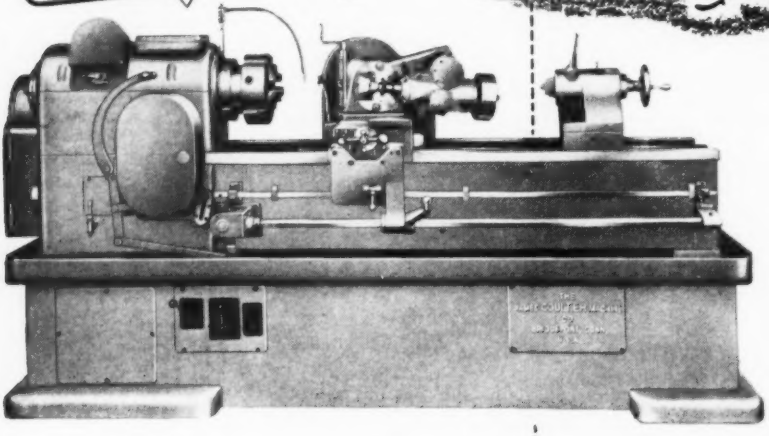
shaping / planing / duplicating / turning

our 51st year

Rockford, Illinois

FASTER AUTOMATIC PRECISION THREADING

The only answer to high cost production blues!



Get set to sing a happy tune, for COULTER can help you banish those *"labor shortage/reject/poor production of threaded part/blues"*.

The COULTER "Threadmaster" (shown above) is one thread milling machine that can produce long and short precision traversing, elevating, crossfeed and lead screws in less time with uncanny accuracy.

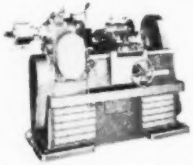
Investigate COULTER AUTOMATIC THREADING MACHINES today — change the "blues" to "cheers" — extract *every cent of profit* possible out of your plant and still maintain the high quality standards you demand.

IF YOU ARE CONFRONTED with a thread production problem, our engineers can help you. Literature available.

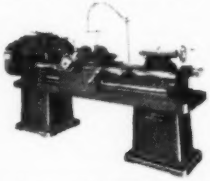
MACHINE TOOL BUILDERS SINCE 1896

The James Coulter Machine Co.

637 **Railroad Ave.** **Bridgeport 5, Conn.**



Model "H1" COULTER HOB THREADING MACHINE produces internal, external, right and left hand threads with precision — Faster — Accurately — AUTOMATICALLY.



Model "L1" COULTER THREADING LATHE produces precision, square, standard and 29 degree internal or external threads in various diameters and materials — Faster — Accurately — AUTOMATICALLY.

the old way
TWO SKILLED OPERATORS
TWO MACHINE TOOLS
TIME: 5 MINUTES
the Rotamatic way
ONE OPERATOR (No Experience)
ONE TYPE B ROTAMATIC GRINDER
TIME: 90 SECONDS!
the job
Finish grind 6" dia. heat treated Steel Cutter Disc. Hub on one side; multiple tapered teeth on other side.

Standard's Endless, Versatile, Variations of Design, Arrangement and Equipment best describe this new automatic line of STANDARD Rotamatic Grinders. Versatility permits application to a wide variety of work. No doubt you have grinding problems that Rotamatic can solve quickly and efficiently. Write us today for Catalog AG and complete details.

- ASSN Spindle Nose
- Rotary Magnetic Chucks
- Complete Hydraulic Operation
- Also 10", 12", 16" & 18" standard Rotary Surface Grinders

Type B Rotamatic Grinder

Standardize with

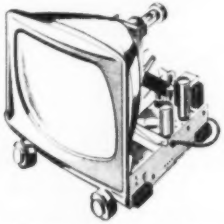
the STANDARD electrical tool co.

MACHINE TOOLS

2486 RIVER ROAD • CINCINNATI 4, • OHIO

See this machine in operation; National Metal Exposition, Cleveland; Oct. 19-23, Booth 840.

UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKOs wherever ordinary cup point set screws are used. On radios, television sets and electronic equipment.

On refrigerators, washing machines, and other household appliances.

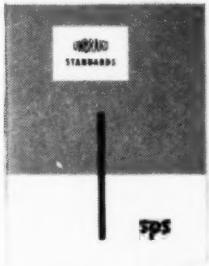
9 times out of 10
a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job —much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for UNBRAKO Standards. SPS, Jenkintown 52, Pa.

UNBRAKO SOCKET SCREW DIVISION

SPS
JENKINTOWN PENNSYLVANIA

On power mowers, power saws and other power tools.



UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

From here to finished

36 Type Gear Shaper Cuts Production Time

Fewer Machines... Greater Accuracy... Lower Costs... these are the results in a plant where two modern 36-Type Fellows Gear Shapers are doing the work of *five* ordinary machines in cutting the spur gears specified in the production chart at the right... producing more work of greater accuracy and cutting operating costs into the bargain.

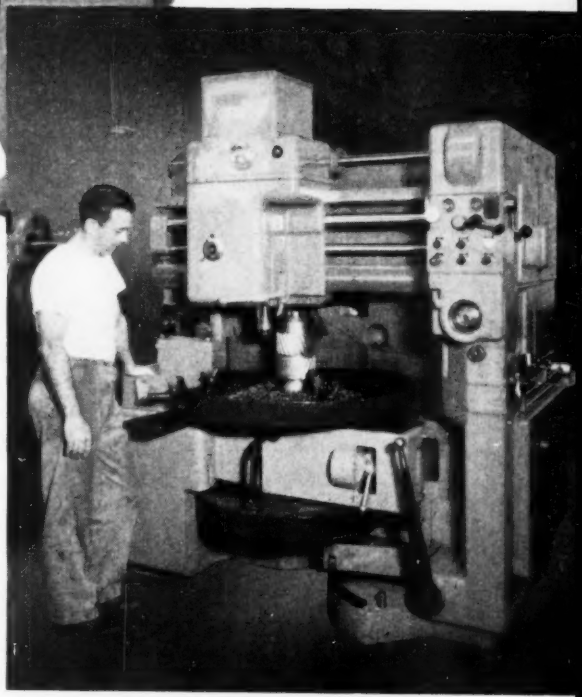
The 36-Type can be adapted to a wide range of work... spur or helical gears, external or internal, herringbone gears as shown in the illustration, splines, and irregular shapes of all sizes up to and including 36" pitch diameter and 6" face width. All these can be generated on this Gear Shaper by the Fellows Method.

You can find out what the 36-Type Gear Shaper can do in your plant by talking with a Fellows Representative.

Fellows

The FELLOWS METHOD
...in action!

gear



By 65%

PRODUCTION PERFORMANCE

LARGE BRONZE SPUR GEAR (TOP)

Material . . . . . High tensile bronze #3
Face width . . . . 4 inches
Pitch diameter . . 34.000 inches (Special)
No. of teeth 138
Diametral pitch . 4
Production Time . 6 hours

Production Time with 36-Type Gear Shaper . . . 1 hr., 55 min.

STEEL SPUR GEAR

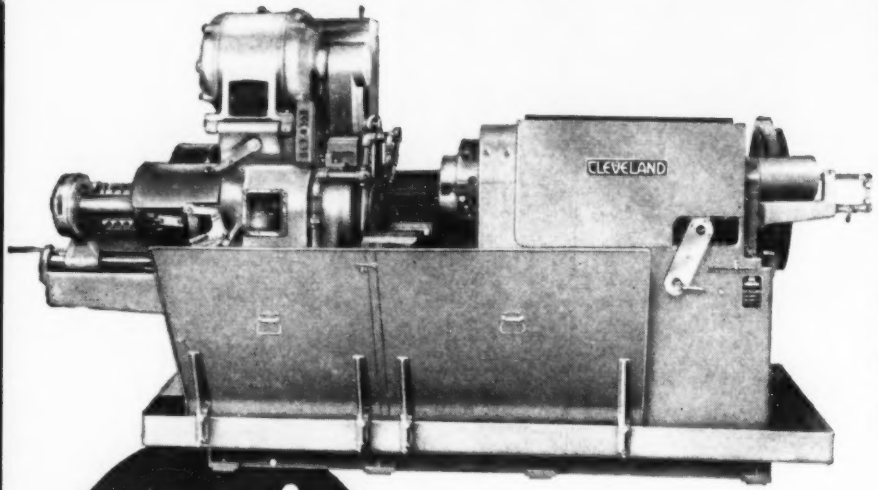
Material . . . . . Steel casting DW-19
Face width . . . . 3 inches
Pitch diameter . . 22.250 inches
No. of teeth 89
Diametral pitch . 4
Production Time . 10 hours

Production Time with 36-Type Gear Shaper . . . 2½ hours

GEAR SHAPER COMPANY

Head Office & Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Ave., Chicago 39.
2206 Empire State Building, New York 1.

NEW AUTOMATICS TO CUT YOUR METALWORKING COSTS



NEW
4¼" MODEL AW
CLEVELAND

CLEVELAND

2½" AND 4¼" MODEL AW SINGLE SPINDLE AUTOMATICS

Simplified, fool-proof design . . . priced exceptionally low

New Model "AW" Clevelands are destined to become the "work horse" automatics of many a shop. These are high-speed, accurate, *rugged* machines—quickly set-up; easily operated. Their simplified mechanical design will result in the reduction of machine maintenance to bare minimum levels.

An example of "AW" economy—the 2½" Model "AW" is offered at a base price $3500 to $4000 *less* than other automatics of comparable capacity! Price of the 4¼" "AW" is proportionately low!

The principal difference between the new series Cleveland "AW" Models and the universally popular Model "AB" Cleveland lies in the turret tool feed drive. Variable forward and return turret feeds on the "AW" machines are obtained through automatic settings of an improved, simplified mechanical drive. This thoroughly tested feed driving mechanism has been Cleveland-engineered to assure the user the utmost in *freedom from downtime!* For shops who prefer the ease and rapidity of set-up provided by *electric feed drive,* the Cleveland "AB" series of automatics is unconditionally recommended.

	2½" AW	4¼" AW
Spindle speed range	69 to 1920 rpm	21 to 648 rpm
Number of spindle speeds	40*	56**
Tool turret diameter	11⅝"	14"
5-Hole tool circle	9"	10"
Stock feed stroke	10½"	14"
Turning length	6"	7⅜"
Idle motion time	11.3 secs.	16.9 secs.

*Four full automatic spindle speeds for each set of five change gears—two automatic speeds through two-speed motor; two automatic speeds through air-operated spindle clutch shifter.

**Four full automatic spindle speeds through four-speed motor—two speed ranges controlled by hand shift clutch with seven speed changes in each range through change gears.

Variable turret tool feeds through friction roll drive.
High-speed Geneva turret index.
Geared anti-friction spindle head.
Wide, flame-hardened double cross slides independently operated by easily adjusted drums.
Universal camming.
Rapid hand crank stock feed adjustment.
Oil feed through turret.
Toggle-type chucking mechanism; three chucking fingers;
Cleveland-designed master collet with quick-change pads.
Safety device prevents running machine with set-up crank engaged.
Motorized chip conveyor available for 4¼" Model AW.

Plus many other new and time-tested features that have earned for Clevelands their outstanding reputation for dependable performance. Get full information on these new money-saving Model "AW" Clevelands now. Call in a Cleveland sales engineer.

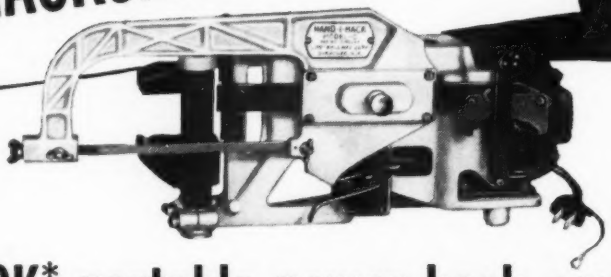
THE CLEVELAND AUTOMATIC MACHINE COMPANY

4934 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

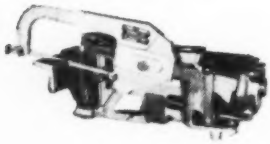
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Stop HACKSAWING by Hand!

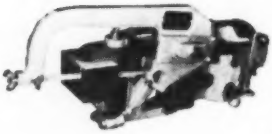


use

HAND-I-HACK* portable power hack saw



Cuts at any angle up to 45°.



Cuts 3" square steel bar.

HAND-I-HACK eliminates the sweat and unproductive cost of manual hacksawing. Rugged—light in weight—Hand-I-Hack can be carried anywhere in the shop to cut bar stock, angle iron, flexible metal tubing, thin-wall tubing—even 4" I-beams.

Attached to the work, it saws in any position: horizontal, vertical, angular, *upside down*. One-quarter HP motor plugs into wall socket. Motors available for all standard circuits.

Cuts are accurate –saves stock. First cost is low —operating and upkeep cost negligible. Another saving: uses low-cost high speed *hand blades*.

● *Write for catalog and name of dealer.*

*T.M. Reg. U.S. Pat. Off.

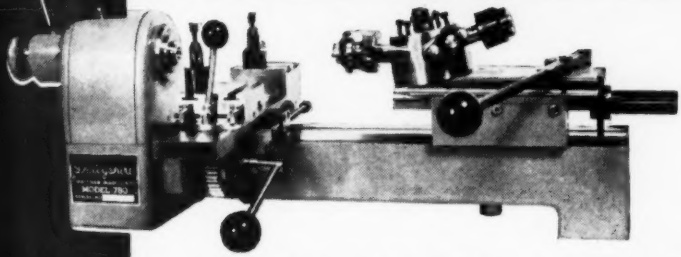
LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION

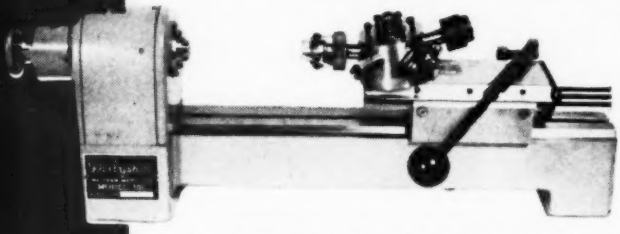
Manufacturers of Automotive Clutches and Machine Tools

818 Emerson Ave., Syracuse 1, N. Y.

DERBY LATHE *Model 750*



Lathe, 22" bed, Ball Bearing Headstock with Lever-Collet Closer, Pt. No. 3804, with Double Compound Slide Rest, Pt. No. 3652 and Six-position, self-indexing and semi-automatic Turret, Pt. No. 3610.

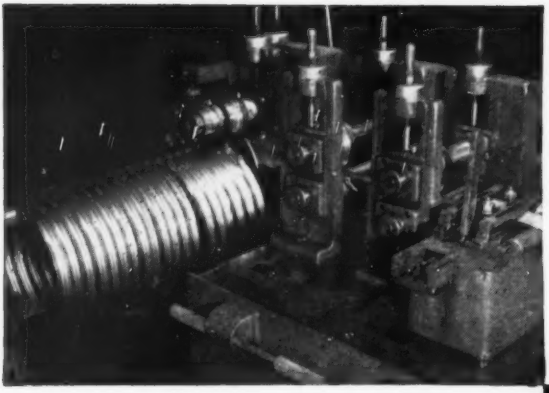


Lathe, 22" bed, Ball Bearing Headstock with Lever-Collet Closer, Pt. No. 3804, with Six-Position, self-indexing and semi-automatic Turret, Pt. No. 3160.

SPECIFICATIONS

Overall Length With Lever Chuck Closer 25"	Distance between Centers.....12"
Length of Bed .....22"	Center Height .....2.953" (7.50 cm)
Height to Top of Headstock 8½"	Maximum Collet Capacity .....315"(⅜")-(No. 80 metric)
Height to Top of Lathe Bed 4"	Maximum Spindle Speed .....18,000 RPM
Width of Bed .....2⅞"	Concentric Running of Ball Bearing Headstock Spindle ..... .0002"
Width of Ways .....1-13/16"	
Swing over Bed .....5.905"(15 cm)	Spindle Speeds with Variable Speed Drive:
Swing over Compound Slide Rest .....2⅜"	With Pulley Ratio 1 to 1..... 600 to 5,000 RPM With Pulley Ratio 2 to 1.....1200 to 10,000 RPM

F. W. DERBYSHIRE INC.
157 HIGH ST. • WALTHAM, MASS.

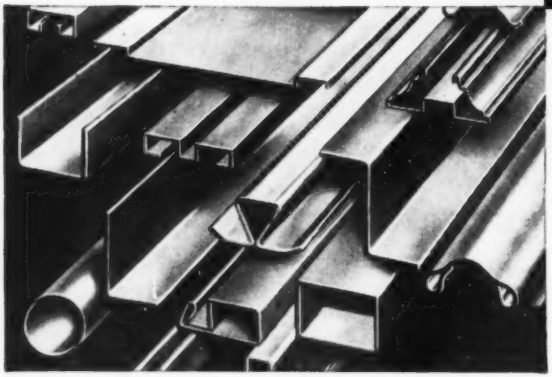


CURVING and coiling to almost any diameter, are two out of many operations which can be performed in a Yoder roll forming machine. As fast as formed, the sections can be continuously coiled and cut to length to make rings for auto hub caps, headlights, wheel trim, stator rings, etc., at a huge saving in cost of materials and labor.

Among other operations which can be tied in with cold roll forming may be

Curving Coiling and Ring Making

IN A COLD ROLL FORMING MACHINE



mentioned embossing, notching, perforating, welding, flattening, lock-seaming, filling and closing tubular shapes, wrapping, edge trimming, etc.

In the design and assembly of production lines of this character, the know-how of the Yoder engineering staff is at your service. The Yoder book on Cold Roll Forming deals broadly with the most important phases of the subject. Ask for it.

THE YODER COMPANY
5509 Walworth Avenue
Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS - cold forming and welding

ENGINEERING YODER MANUFACTURING

EXTRA POWER *for top performance*

In A Jet Plane, rockets supply the extra launching power needed for fast-climbing takeoff. In industry, Jacobs Plain Bearing Chucks supply the extra gripping power vital to top performance in light- and medium-duty drilling. This, plus rugged construction and precision accuracy, makes them the world's most widely used chucks.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

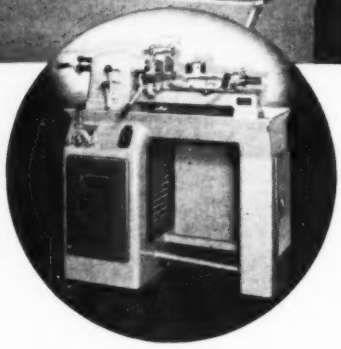
. . . first in service

ELGIN
SCREW MACHINES

For Fast, Accurate Production of Small Parts . . .

You can depend on Elgin Hand Screw Machines for the accuracy needed in turning out small precision parts. And they are sturdily built to maintain close tolerances over long production runs.

Spindle speeds, 120 to 3780 R.P.M. Variable Speed Drive provides change of speed without stopping spindle and is directly reversible. Collet capacity, 1 inch. Nine inch Swing. Two-speed Motor, ¾-⅜ H.P. Coolant System mounted in back and outside for convenience.



Knee Hole Bench affords operator utmost comfort and convenience directly in front of work.

ELGIN TOOL WORKS

1772 BERTEAU AVENUE • CHICAGO 13, ILLINOIS

US DRILL HEADS

Expertly Designed

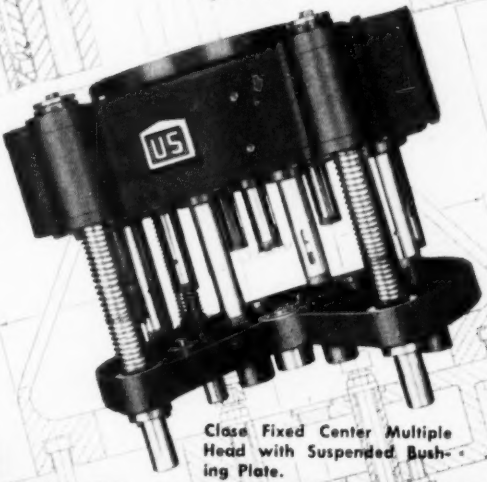
to Fit YOUR Needs For...
DRILLING • TAPPING •
SPOTFACING • REAMING
BORING

NOW WITH SHAVED GEARS at no extra cost!

Fixed Center Oil Circulating Spindle Head with Vertical Adjustment Spindles. Designed mainly for high speeds.

Standard Fixed Center Construction. Bushed Guide Rod Holes and Lifter Rod Holes with Vertical Adjustment Spindles.

We manufacture, at lowest possible price, all types of multiple spindle fixed center adjustable and lead screw tapping heads.



Close Fixed Center Multiple Head with Suspended Bushing Plate.

UNITED STATES DRILL HEAD CO. • CINCINNATI 4, OHIO

JOHNSON BAND SAWS

BOTH WET AND DRY MODELS

SPECIFICATIONS—MODEL J

Capacity—10″ rounds, 18″ flats
Motor—½ H.P. Ball Bearing any voltage available, single or polyphase (¾ H.P. on wet machine).
Wheel Diameters—16″.
Floor Space—66″ x 31″.
Bed—11″ wide, 44″ long, 6″ deep, 24″ high.
Overall Height (Closed)—39″.
Blade Length—11′5″ x ¾″ x 032″ All Standard blades of these specifications can be used.
Weight—Approximately 750 lbs. Crated 800 lbs. Boxed for export 875 lbs.
Speeds—35, 90, 130, 190 feet per minute.
Casters—Optional at slight extra cost.

MODEL B, 5″ x 10″ CAPACITY ALSO AVAILABLE

WRITE FOR DETAILS

JOHNSON MANUFACTURING CORP.

ALBION, MICHIGAN

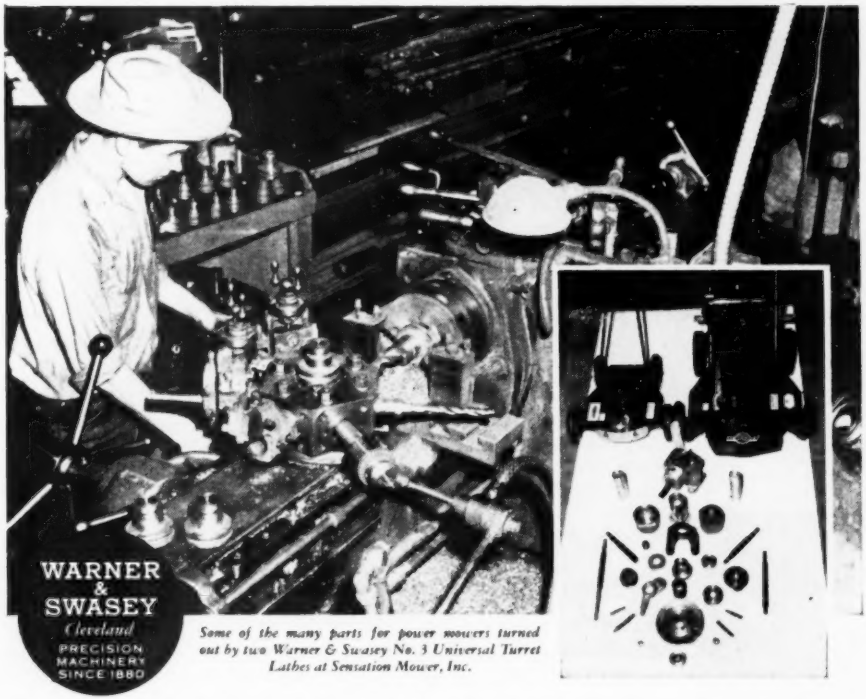
For Big Business–SURE
...and Small Business, too!

SENSATION MOWER, INC., Ralston, Nebraska, is not a high production shop in terms of metalworking plants. But this relatively young company, using only two Warner & Swasey No. 3 Universal Turret Lathes for their entire metal turning needs, was able to compete effectively and grow in the power lawn mower field.

The two Warner & Swaseys give Sensation Mower the versatility they need to produce over 40 different parts for mowers. They also turn out parts for newer lines of snow removal equipment and power floor polishers. The Warner & Swaseys' versatility has even enabled the company to take on sub-contract work during their "off-season".

Both machines have had a total of *only one day's downtime* since their installation in 1946!

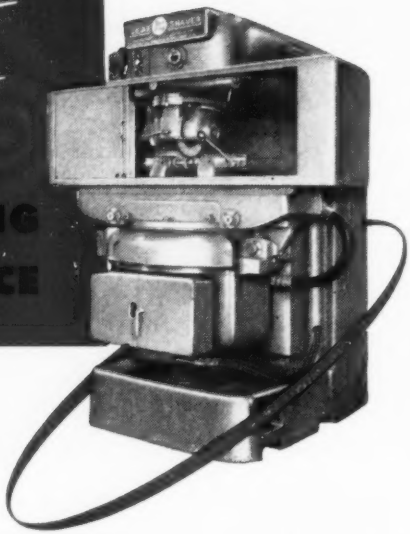
You can count on this kind of highly versatile, dependable production with Warner & Swasey Turret Lathes–money-makers whether you're a small manufacturer or in business in a "big" way!

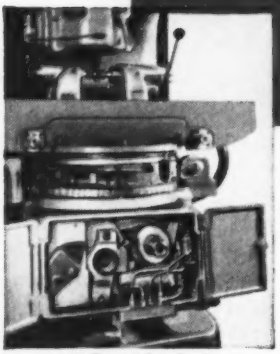


Some of the many parts for power mowers turned out by two Warner & Swasey No. 3 Universal Turret Lathes at Sensation Mower, Inc.

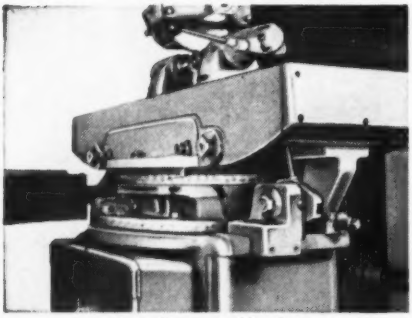
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

An Important Contribution To GEAR SHAVING PRACTICE





Differential up-feed mechanism



Crowning cam and bracket

Two new features are now optionally available with the Red Ring Gear Shaving Machine Model GCU — Automatic Differential Up-feed and Conventional Crowning. So equipped, any of the recognized processes in the field of rotary gear shaving may be performed on this machine. It thus becomes economically applicable to both high production and to job shop operations and to gears of all characteristics within its size range.

Specifically the Model GCU with these additions can be used for:

(1) Diagonal shaving at fixed center distance on a two stroke cycle.
(2) Diagonal shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(3) Conventional shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
(4) Precision gear crowning accomplished by rocking the table during any conventional shaving cycle.
(5) Taper shaving to specification.

Automatic cycling is precise and very fast. Production rates are high and cutter life has been increased to as much as 200%.

Write for Bulletin 553-7 which gives all the details of this important new development.

NATIONAL BROACH & MACHINE CO.

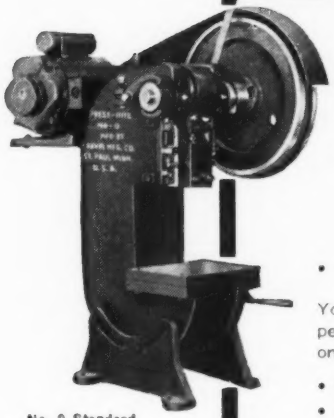
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Increase Production and Cut Costs with . . .

PRESS-RITE

No. 0 POWER PRESSES

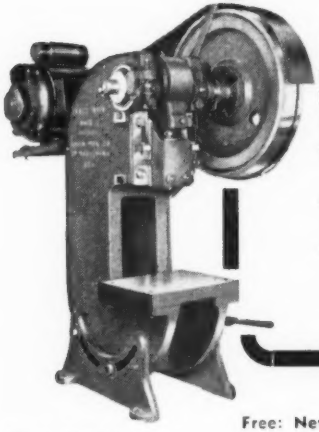


No. 0 Standard Bench Model 5 Ton

. . . for REGULAR DUTY

You can depend on Press-Rite for **more** per machine, per operator, per dollar invested than any other press on the market.

- **high tensile reinforced alloy frame**
- **greater die space**
- **triple ramway lubrication**
- **adjustable gibs for perfect alignment**



No. 0 Hi-Production Bench Model 5 Ton

. . . for HIGH PRODUCTION

Dependable efficiency for long production runs is assured by such features as . . .

- **roller bearings in flywheel**
- **specially developed sliding key clutch with 4 point engagement drive ring**
- **Bronze brushed main bearings and connecting rod bearings**
- **automatic cam actuated brake**

Free: **New** catalog containing full details and specifications of the entire Press-Rite line. Write for your copy today.

Sales Service Machine Tool Co. SSMT

PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

2357 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA

JIG GRINDING ACCURACY *guaranteed**

INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

*Dependably accurate to "tenths"

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

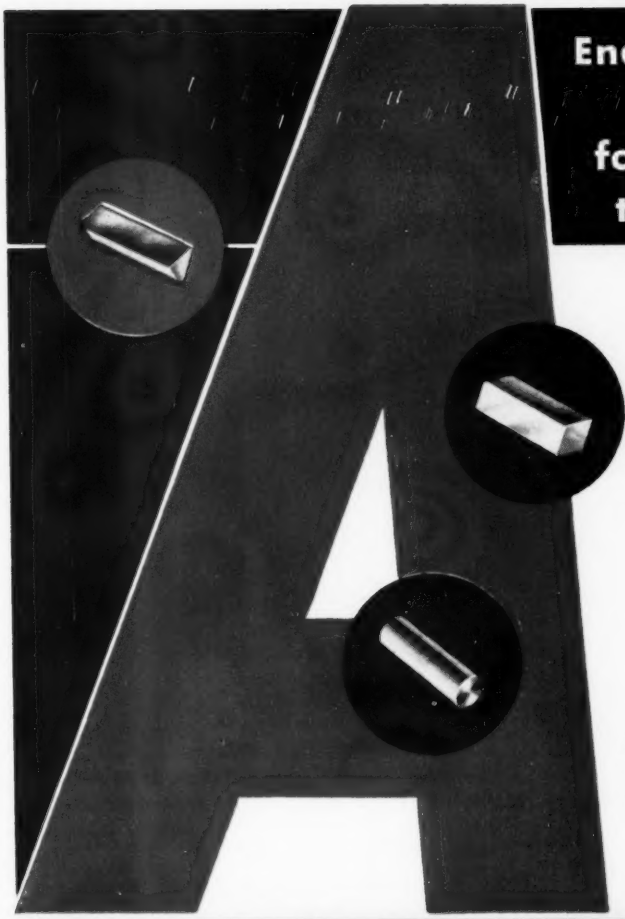
Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3 5/16" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

Vulcanaire

It's built by toolmakers for toolmakers

VULCAN TOOL CO., **HIGHLAND & LORAIN, DAYTON 10, OHIO**



Endurance Insurance for your tools

Your tools need insurance, too! . . . the kind that Adamas Carbide gives:

Premium performance . . . work-proved Adamas Carbide grades, job-engineered to fit both YOUR special and standard applications.

Coverage against costly down-time . . . there's no faster delivery in the industry than Adamas'.

It costs you no more to get this ***protection*** . . . maximum tool-life, minimum production costs.

Write, wire or phone for your ADAMAS CARBIDE catalog today . . . and get the "best tips" in the industry.

ADAMAS

TUNGSTEN CARBIDE ®

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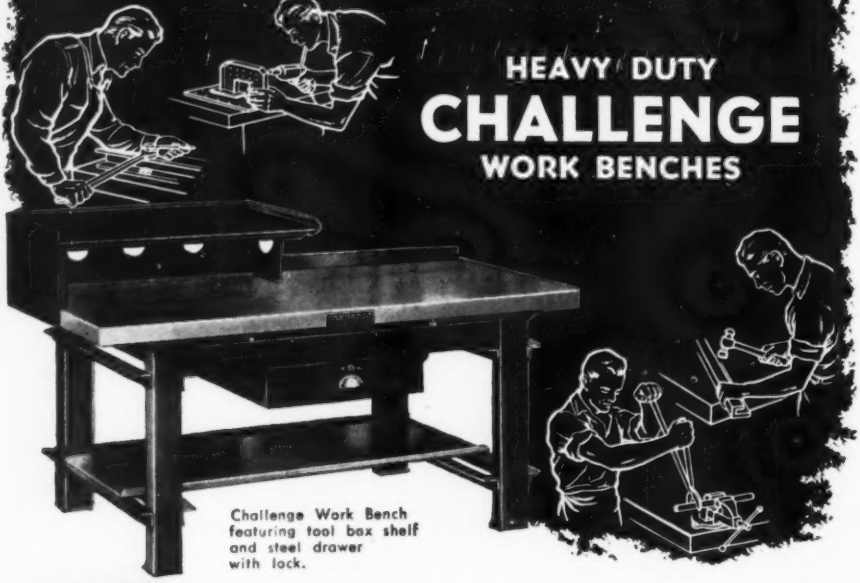
VALUABLE EQUIPMENT IN ANY SHOP . . .

HEAVY DUTY
CHALLENGE
WORK BENCHES



Challenge Work Bench featuring tool box shelf and steel drawer with lock.

Challenge Work Bench with tool box shelf.

Challenge Work Bench without shelf or drawer.

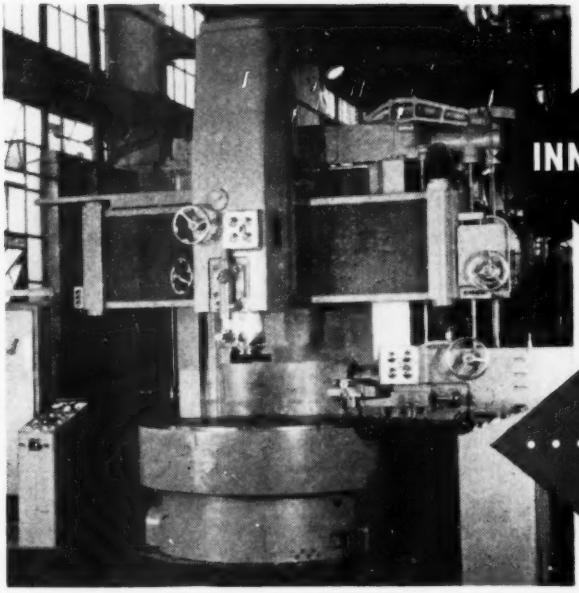
Whatever your requirements may be — there is a Challenge work bench to meet your needs. Each has a durable cast-iron top two inches thick — will not warp, shrink, splinter or burn. And every one has leveling screws to insure a perfectly level and accurate surface. Legs are strong and solidly braced.

A COMPLETE RANGE OF SIZES AND STYLES

Three styles as shown . . . ***Four*** sizes: (top dimensions) 28x48 and 28x60 with four legs; 28 x 72 and 28 x 84 with six legs. Write for details and prices. 707R

Challenge
TRADE-MARK ®

THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN



AN INNOVATION *in* VERTICAL CHUCKING GRINDING MACHINES

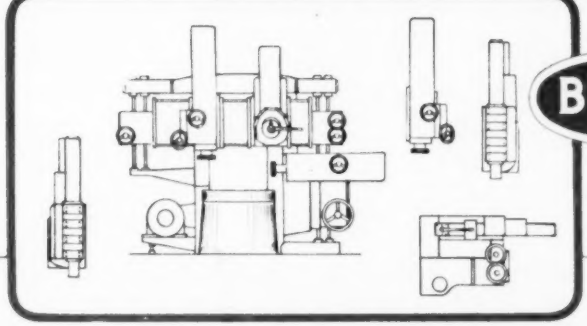
Your Grinding Jobs Included . . . Keep the Machine Paying Its Way . . .

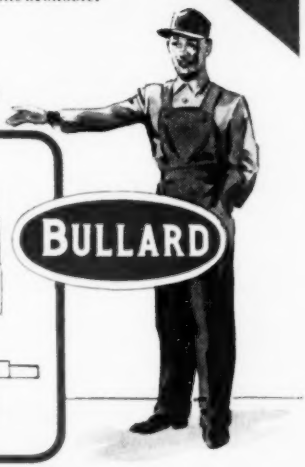
NOW . . .
Practical Versatility

BY . . .
Grinding, Boring, Facing or Turning with several head combinations available.

ASSURED
Sufficient horsepower for regular machining cuts first . . .
Grinding work next . . . on the SAME machine.

POSSIBLE HEAD COMBINATIONS on BULLARD VERTICAL CHUCKING GRINDING MACHINES





THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Beaver QUICK-CHANGE VERSATILITY CUTS OPERATIONAL COSTS

No matter what your tool requirements may be – no matter how often tools must be changed–Beaver Quick-Change Tool Holders and Adaptors will save you money. Less than ten seconds per tool change and no loss of accuracy gives you maximum production from each machine.

Beaver Quick-Change Tooling can be installed on most standard machines. Let us show you how it will benefit YOUR machine operations

Write for our complete catalog #52.

Beaver TOOL AND ENGINEERING CORPORATION

2850 ROCHESTER ROAD • BOX 429, ROYAL OAK, MICH., Teletype – Big Beaver 648

BEAVER TOOLS ARE WORKIN' FOOLS!

Don't Play Games

with your PRODUCTION PROBLEMS

Whether it's carbide or steel — accuracy and precision are watchwords from top to bottom in the Harig organization. Many years of experience in serving the highly specialized needs of American industry are built into every Harig product. It is your guarantee of superior craftsmanship and on the job performance.

Let Harig engineering and planning help you solve *your* production problems.

SEND TODAY
for this complete catalog of information on HARIG services and facilities.

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Manufacturing Corp.
5761 W. HOWARD ST. • CHICAGO 31, ILL.

INCREASE PRODUCTION • CUT COSTS • IMPROVE QUALITY

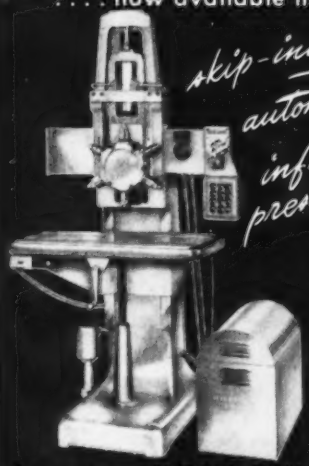
....with

Burgmaster

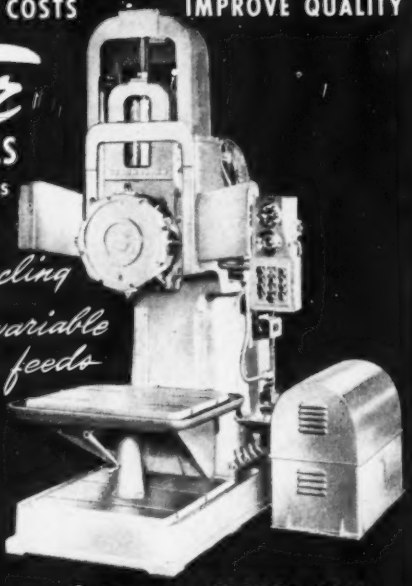
TURRET DRILLS

....now available in 3 models

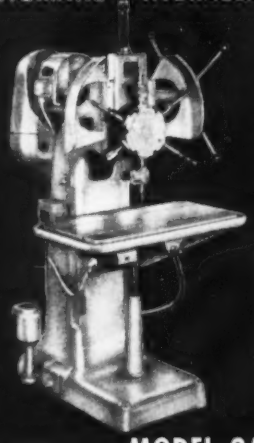
skip-indexing
automatic cycling
infinitely variable
preselective feeds



6 SPINDLE MODEL 2BH
AUTOMATIC • HYDRAULIC



8 SPINDLE MODEL 3BH
AUTOMATIC • HYDRAULIC



6 SPINDLE MODEL 2A
MANUAL

SPECIFICATIONS:

	MODEL 3BH	MODEL 2BH	MODEL 2A
Drill capacity, mild steel	1 1/4"	3/4"	3/4"
Ram travel	12"	8"	8"
Spindle speeds, preselective	12	12	12
Speed range	115-1700	225-3000	225-3000
Depth control	Preselective	Preselective	Preselective
Throat depth	19 1/2"	12"	12"
Table work surface	25"x 35"	17"x 34"	17"x 34"
Table travel	19"	19"	19"
Max. cl'rance, spindle to table	32"	23"	23"
Max. diameter tool clearance	9"	4 1/2"	4 1/2"
Motor, 2-speed, 1800/900	10/5 H.P.	2/1 H.P.	2/1 H.P.
Weight, approximate	7000 lbs.	2500 lbs.	1800 lbs.
Height	120"	78"	72"
Floor space, approximate	6'6"x 5'4"	60"x 51"	38"x 51"

WRITE TODAY FOR DETAILED INFORMATION

BURG TOOL MFG. CO. Dept. BB-10

3743 DURANGO AVE • LOS ANGELES 34 CALIFORNIA

RE-TOOLING?

Boring Tools *by* LEHMANN *can:*

- **Put Accuracy, Utility and Economy into your Boring Operations**
- **Stop Costly Errors in Tool Setting**

That's right! The engineering staff and skilled machinists at LEHMANN can help you put efficiency and accuracy to work in your boring operations. Boring tools especially designed and engineered for your needs, help cut machining time to a minimum, give you accuracy, save you money! LEHMANN Boring Tools have been approved by industry for 35 years. Put LEHMANN'S experience to work for you.

Shown at right is a partial set of 36 boring bars especially designed for a large lathe manufacturer, by LEHMANN BORING TOOL for a re-tooling program on a new lathe headstock.

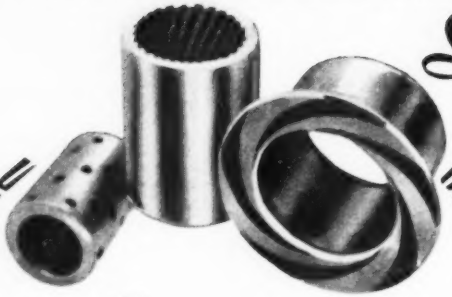
Tell us your boring problems without obligation or write today for CATALOG BT-12 to:

LEHMANN BORING TOOL

4389 Duncan Ave., St. Louis 10, Mo.

DIVISION NOVO ENGINE CO.

JOHNSON Graphited BEARINGS for Special uses



Johnson Graphited Sleeve Bearings were developed primarily for applications where lubrication is difficult or likely to be neglected. Other important uses are: where the shaft speed is too slow or the temperature too low to sustain an oil film; where high operating temperatures may burn out oils and greases; where lubricants might damage goods or foods in process; where dripping oil cannot be tolerated; and certain underwater applications. Johnson Graphited Bearings are available in three types: with serrated grooves, graphite plugs, and graphite-filled oil grooves. The serrated type is a stock item in over 200 sizes, available through Johnson Distributors.

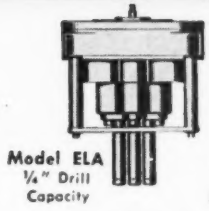
JOHNSON BRONZE COMPANY
615 South Mill Street • New Castle, Pennsylvania

Write for full information

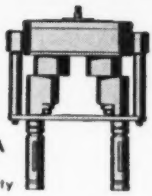
JOHNSON B BEARINGS
Sleeve-Type

OTHER BEARING TYPES:
General Purpose • Electric Motor • Universal Bronze Bars • Babbitt Metal

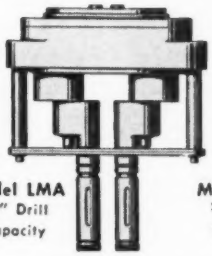
HEADS to Solve Your Drilling, Tapping, Boring Problems



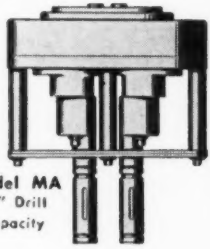
Model ELA
¼" Drill Capacity



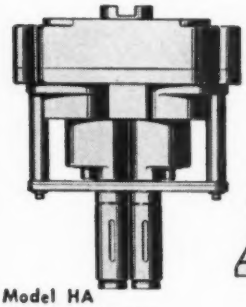
Model LA
13/32" Drill Capacity



Model LMA
⅝" Drill Capacity

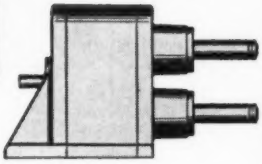


Model MA
¾" Drill Capacity



Model HA
1¼" Drill Capacity

Fixed Spindle Models
Size and Capacity as specified



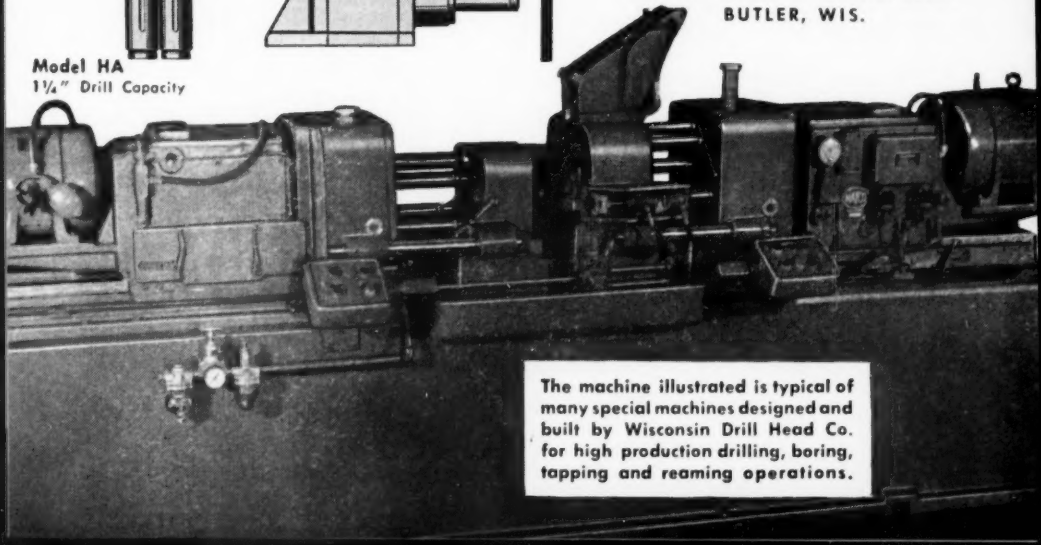
WISCONSIN *Adjustable Spindle*
Drill Heads completely gear driven... are available in 5 Standard Models, with 2 to 8 spindles and Drill Capacities from ¼" to 1¼" . . . permit adjustment to any hole pattern. Adjustable Heads with 9 or more spindles are built-to-order.

WISCONSIN *Adjustable Spindle*
Drill Heads...have Two-Piece Positioning Templates for Fast, Accurate Set-ups that stay put.

WISCONSIN *Fixed Spindle*
Drill Heads are built to special order in any size or capacity specified for Drilling, Tapping, Reaming and Boring.

Look to Wisconsin for Drill Heads to solve Your Problems.

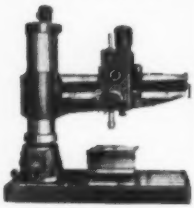
WISCONSIN
DRILL HEAD COMPANY
BUTLER, WIS.



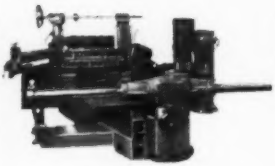
The machine illustrated is typical of many special machines designed and built by Wisconsin Drill Head Co. for high production drilling, boring, tapping and reaming operations.

NEW MACHINE TOOLS

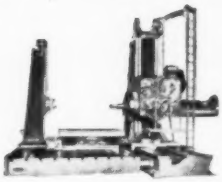
MANUFACTURED BY LEADING MACHINE TOOL BUILDERS



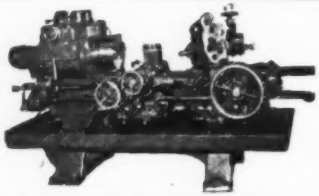
Radial Drills—2', 3', 4', 5', 6', 7', 8', and 10'.



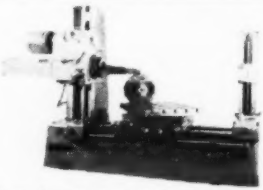
New Slitters, All Sizes, with Coilers and Recoilers.



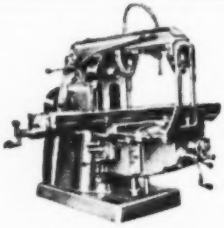
Horizontal Boring Mills, Table & Floor Type, up to 10"; Rotary Tables of Desired Sizes Available.



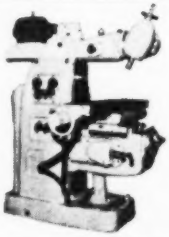
Ram & Saddle Type Turret Lathes, Nos. 3, 4, 1A, 2A, 3A. Also 40E Automatic Electro-Cycle.



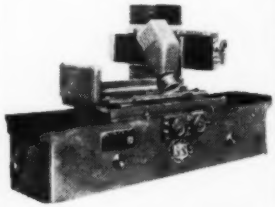
S&S 3" Boring Mill, Built-in Rotary Table, 70" to Outboard, 31½" Spindle to Table. Available up to 92" to Outboard, 48" Spindle to Table.



No. 4 Di Palo Dial Type High-Speed Plain Milling Machine Available. Also: Nos. 2, 3, 4, 5, 6, 10, Plain, Universal & Vertical.



S&S No. 2 Miller, Universal or Plain. Longitudinal Travel—31½". Spindle to Column—35". Available with Motorized Overarm Attachment.



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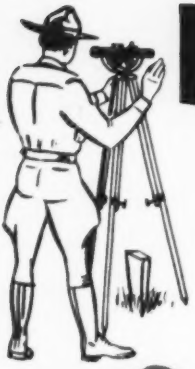
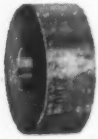


The Land You Build On Requires Marking Devices

When measuring land areas or construction sites, surveyors mark boundaries with stakes or chalk. Working crews then can depend on these marking devices to insure dimensional limits and safeguarding of property rights.

PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.



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ENGRAVED STEEL SEGMENT DIES
Segment die system ideal for stamping circular and flat work (trademarks, sizes, etc.).

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Compact, self-contained and manifold mounted, this machine gives full range of marking depth with one control from extremely shallow impression up to very deep impression. It will mark round, flat and irregular surfaces. Features: repeat action; capacity up to 110 one inch strokes per minute; up to 12,000 lbs. pressure.

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keeps cutting tool and work at room temperatures!

lo-jet acro's *proven results in America's leading industries are making production history, from coast to coast!*

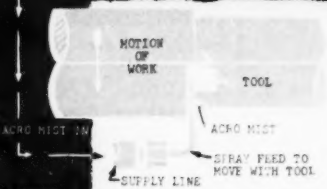
* Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

Pictured here is the 8½" outlet centrifugal equalizer distributor with 8 copper tube spray feed. This assembly serves 8 cutting operations.

lo-jet acro

- prolongs tool life
- cuts tool breakage loss
- saves money
- speeds production
- keeps work clean

there is a lo-jet acro *system for every purpose and every machine.*



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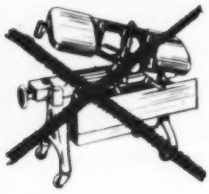
AN ALL-NEW DESIGN . . . FIRST TO MEET TODAY'S METAL CUTTING NEEDS!



Model 8C's smooth, clean-cut design eliminates the multitude of clothes-catching, dirt-catching and knuckle-barking projections common to conventional metal cutting band saws.

You'll get performance never before available when you get the ALL-NEW Model 8C band saw. Designed to meet your metal cutting needs today—and for a *long time* to come—Model 8C embodies years of *Kalamazoo* experience in the field and the best industrial design talent.

Once you've *seen* the new 8C, you'll agree it has everything you've been looking for in an 8-inch metal cutting band saw. Ask your dealer for a demonstration *soon*—or write today for descriptive literature and name of your nearest dealer.

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Kalamazoo TANK and SILO COMPANY

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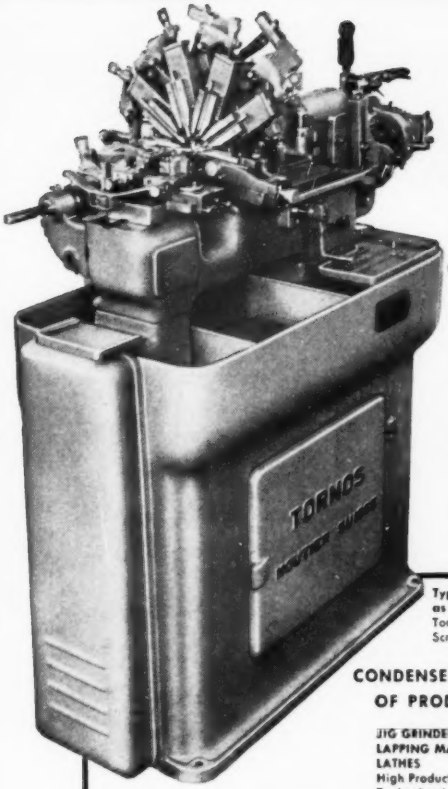
SWISS BLUE RIBBON PRECISION MACHINE TOOLS



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Typical as to precision and as to fame of trade name. Tornos R10 Swiss Automatic Screw Machine.

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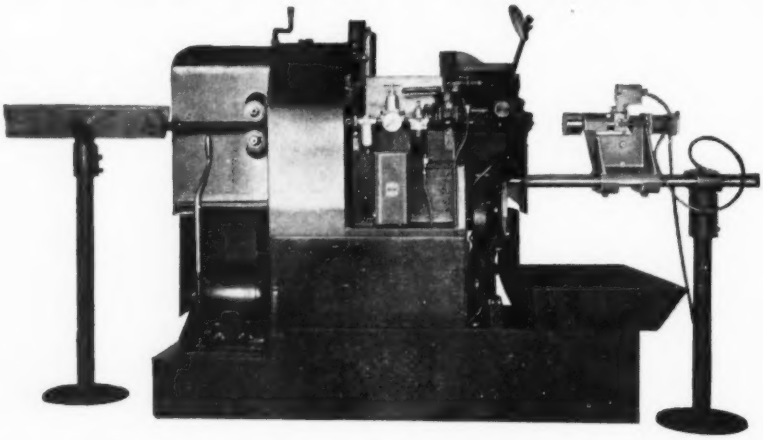
The NEW MODERN AUTOMATIC
CUTTING-OFF MACHINE



Cuts Off Tubing Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off *any length you want*—and cuts it *faster*. If your production requires quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

½" Tubing

This machine cuts off and chamfers both outside edges of ½" .030 wall tubing, 5" long at the rate of one every 2.5 seconds.

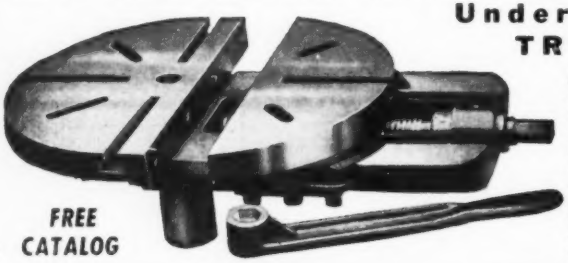
1¼" Cold Rolled

This machine cuts off and chamfers both ends of 1¼" cold rolled, 20" long, at the rate of one every 20 seconds.

1" Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

TRY THE MODERN SAFETY DRILL TABLE
Under Our FREE TRIAL OFFER



FREE CATALOG

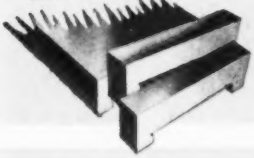
Combines drill table, vise, parallels and V-block. Insures safer, faster work. We guarantee it will save its cost on labor alone in 6 months or your money back. Write for folder, with typical set-ups and specifications of all models.

MODERN MACHINE TOOL COMPANY
Jackson, Michigan

HOW HARD are OK hardened ways?

ONE CUSTOMER SHOWED US BY:

1. Taking a section from an OK bedway



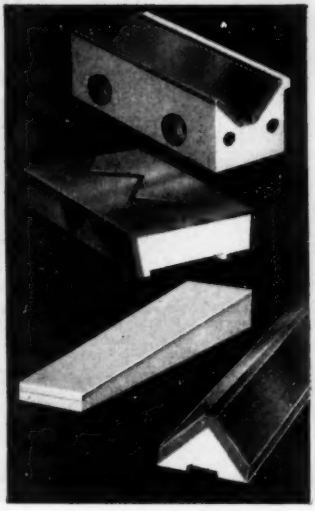
2. Making it into a "tool bit"

3. Then cutting metal with it (1045 cold rolled steel)

The Gisholt Machine Co., Madison, Wisconsin, who use Ohio Knife bedways exclusively on their ram and saddle type Turret Lathes, made the above dramatic test for one of their customers. RESULT—another sale of a famous Gisholt Turret Lathe.

This super uniform hardness on the wear surfaces to a depth of 3/16" (64-66 Rockwell "C") is the reason why more and more OK ways, gibs, races, etc., are being specified on new equipment and used as replacements where former parts have failed. OK ways are practically wear proof assuring constant accuracy throughout the life of your machine. Enjoy with many prominent machine tool builders and users, the long wearing, supreme accuracy, super hardness of OK ways. Many sizes, shapes, etc , available, or made to your specifications.

OK wear strips are now available in welded Ampco bronze.
(Reg. U. S. Pat. Office by Ampco Metal Inc.)



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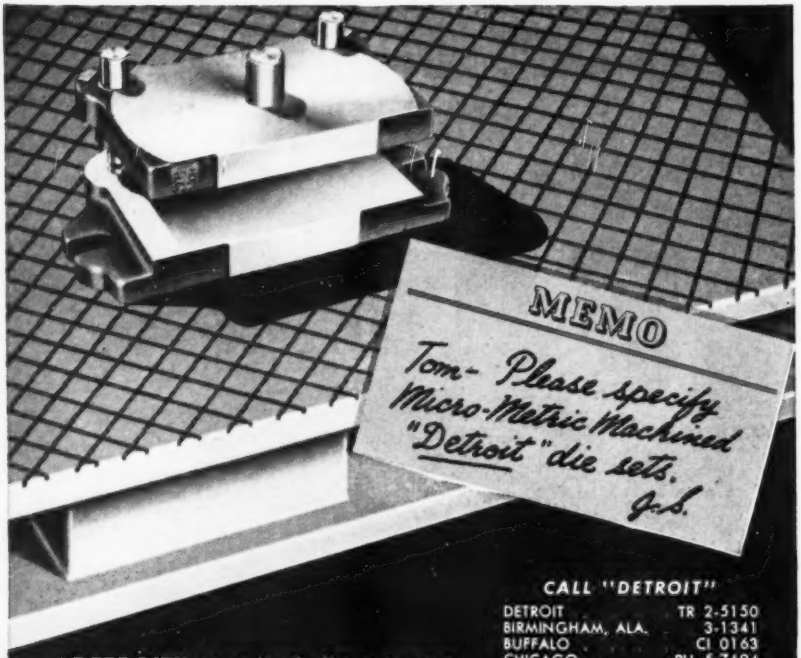

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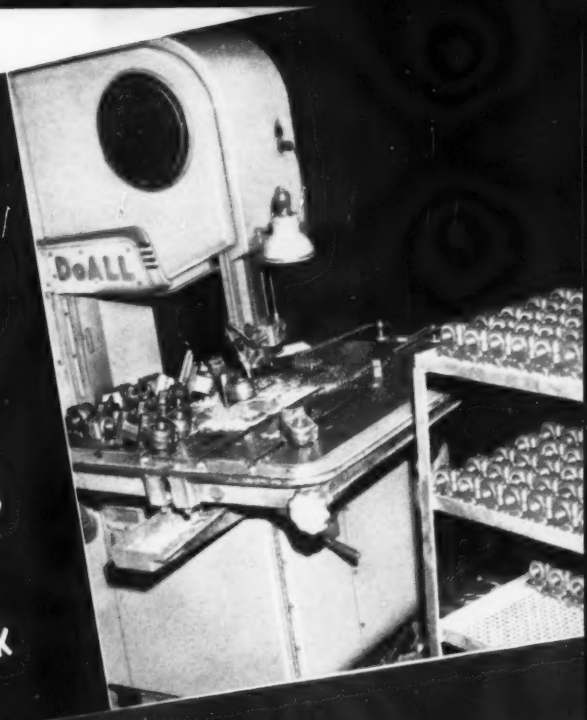
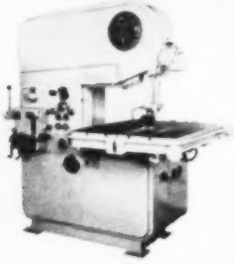
The Band Machine is as Basic as the Lathe ... for production Work

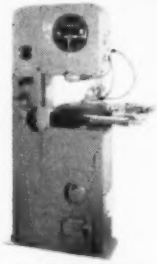


A BAND MACHINE FOR EVERY REQUIREMENT

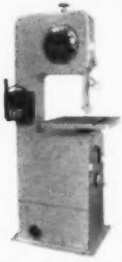


DoALL CONTOUR-MATIC—hydraulic operation. 40 to 10,000 blade feet per minute.

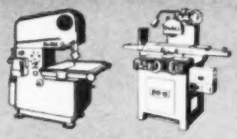
DoALL ZEPHYR—up to 15,000 feet per minute. 16" to 60" throat capacity.



DoALL CONTOUR—an all around machine for precision work.



DoALL UTILITY—low cost handyman for big and small shops.



MACHINE TOOLS

CUTTING TOOLS

GAGING EQUIPMENT

Mass production slimming of roller zones using simple revolving fixture.

DoALL Contour-matic, with simple fixture bolted to the table. Automatic hydraulic power feed table does the work. Operator simply puts work piece in position.

Fixture and auxiliary table permits easy, high speed, sharp cutting.

MASS PRODUCTION BAND MACHINING IS A MATTER OF SIMPLE FIXTURES

PRODUCTION costs are highly dependent on methods. Mass production band machining is a work method that has cut costs in hundreds of plants and very possibly can in yours. Slitting—slotting—stock removal prior to milling, shaping, turning and other operations—contour sawing to final shape and many other jobs can be performed almost automatically on DoALL machines with proper fixtures.

The above illustrations show three typical applications of production bandsawing. The opportunities are limited only by the ingenuity of the user.

To lower costs, investigate bandsawing. ASK FOR LITERATURE. Call your local DoALL Sales-Service Store, or write:

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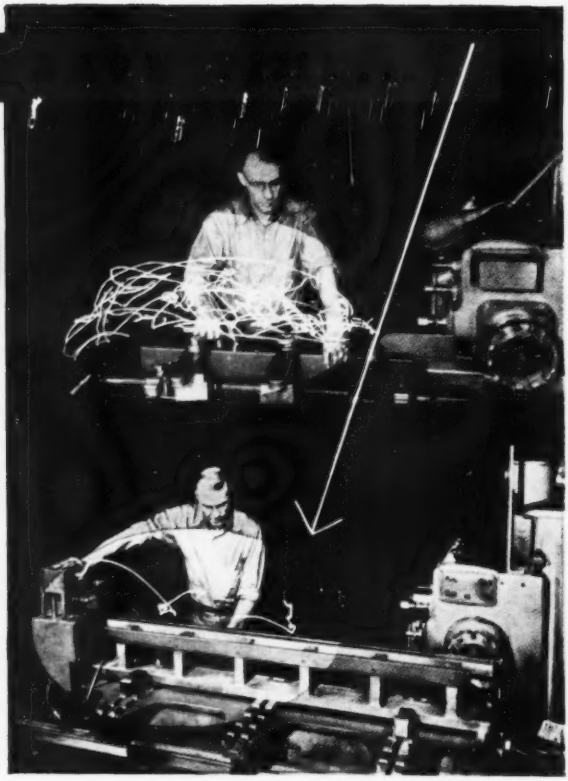
by Eliminating Mechanical Clamping



Here's an interesting comparison between mechanical clamping and Sundstrand Magnetic clamping. The job is the same in both pictures. In the upper illustration the part is held on the table with mechanical clamps. In the lower picture the same part has been located and clamped in a magnetic fixture. Lights attached to the operator's wrists show how excessive motion has been eliminated with the Sundstrand magnetic fixture.

There are other benefits available from magnetic clamping: longer tool life, more uniform clamping and elimination of operator's fatigue are a few. There are more. Investigate.

is available on Sundstrand magmetic clamping fixtures. Write today. Ask for bulletin 437.

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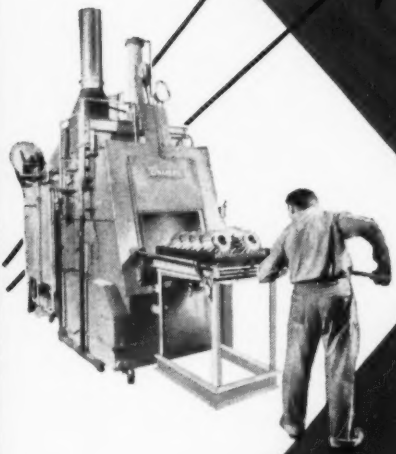
the Lindberg Carbonitriding Furnace

Yes, it's many furnaces in one! It's designed not only for carbonitriding . . but also for hardening, carburizing and carbon restoration. It's self contained . . it's easy to maintain!



10 reasons why Lindberg Carbonitriding Furnaces are better

1. Heating is by new type, gas-fired, vertical radiant tubes. They weigh only 29 pounds each . . can be changed in two minutes.
2. Vertical radiant tubes last longer . . often two or three times as long.
3. Quench tank is built-in . . no costly excavation or piping necessary.
4. Quench tank has fin type oil cooler . . maintains oil at proper temperature.
5. Specially designed chamber purges work before it enters heating chamber.
6. Special check-light system tells you where charge is at any given time.
7. Control of heating and quenching cycle is automatic.
8. Lindberg Carbonitriding Furnaces are made for automatic, semi-automatic, or manual charging.
9. Lindberg Carbonitriding Furnaces have been tested under three years of rough operating conditions.
10. Lindberg "Hyen" generators which supply atmosphere for Lindberg Carbonitriding Furnaces are instantly adjustable for many different types of atmospheres.

For full details, ask for bulletin #241

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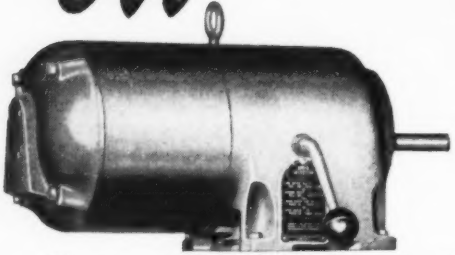
Lindberg Engineering Company • 2450 West Hubbard Street • Chicago 21, Illinois

LIMA GEARSHIFT DRIVES

Offer



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☆ GREATER MACHINE FLEXIBILITY

☆ LOWER OPERATING COSTS

If you want to *increase* production and *reduce* operating costs—eliminate obsolete overhead lineshafting!

LIMA GEARSHIFT DRIVES have been designed to individually motorize all types of machine tools and production equipment — economically.

Why not let our experienced Sales Engineering Staff help solve your motorizing problems—an accurate survey of your requirements involves no obligation.

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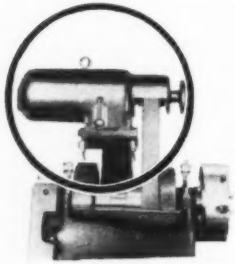
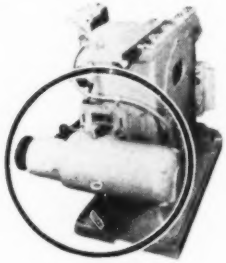
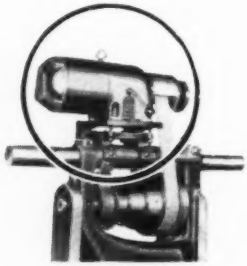


LATHE



SHAPER



MILLING MACHINE

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Coast To Coast Representation

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THE LIMA ELECTRIC MOTOR COMPANY 270 Findlay Road • Lima, Ohio.

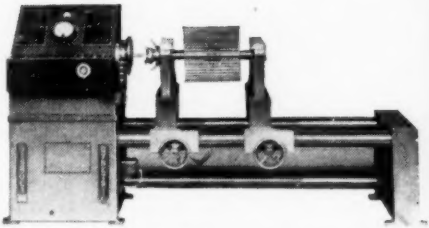
the final *check* for every rotating part...

Maybe it's a crankshaft or an armature . . . perhaps a fan or a belt pulley. No matter. The important thing is this: If it isn't *balanced*, it isn't ready for service.

Smooth operation and long life require that accurate static and dynamic balance be rated right along with mechanical specifications to assure the efficiency of the finished product.

Gisholt Balancing Machines can locate and measure unbalance vibrations down to .000025" with simple readings . . . handle any assembly from ½ ounce to 50 tons.

The cost? Very moderate. Let Gisholt Balancing Machines provide the final check. Write us.



The Gisholt Type 3U Balancer shown here is capable of balancing rotating parts or assemblies weighing from 50 to 1000 pounds. Other sizes and types are available to answer any balancing problem. Gisholt Balancers can also be furnished with correction equipment to meet your own specific requirements.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

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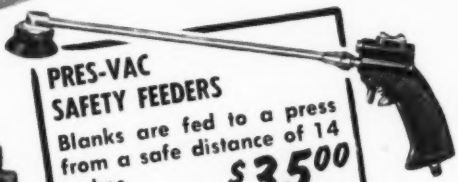
AIR BLAST VALVES
Eject parts at each stroke of Press. PRICE **$29.00**



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Blanks are fed to a press from a safe distance of 14 inches. PRICE **$35.00**

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Choose Atkins hacksaw blades or bandsaws to give you the right alloy, the right edge to save time and cut costs on every metal-cutting job.

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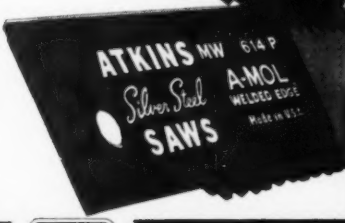
Tungsten 18-14-1
. . . cuts the toughest jobs

New **A-MOL**
Solid Molybdenum
. . . tops for all-round cutting



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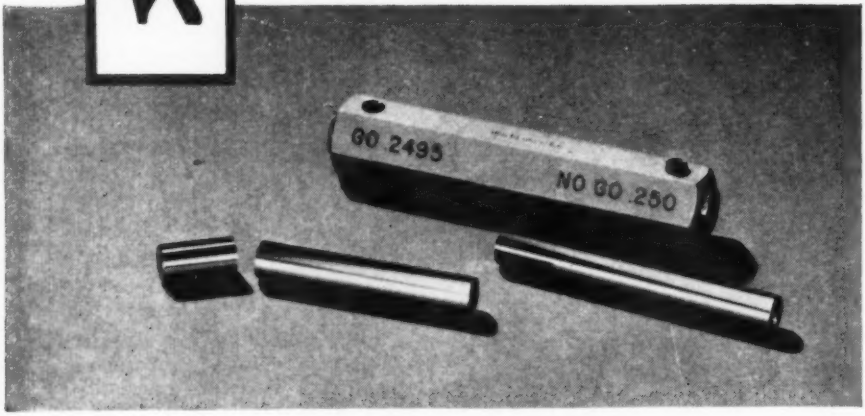
VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED AND MONEY-SAVERS

BECAUSE THEY'RE "CUT-OFF-ABLE" AS WELL AS "REVERSIBLE"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1 7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 35, available on request by writing to: The Van Keuren Co., 177 Waltham St., Watertown, Mass.

VK

34th YEAR

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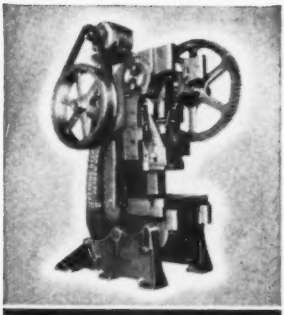
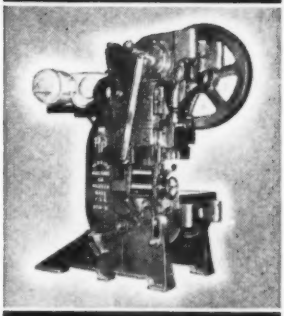
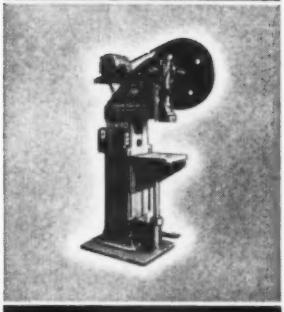


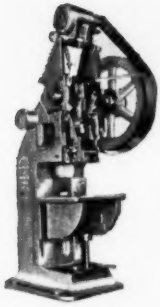
#700 B GEAR PRESS



650-B PLAIN FLY WHEEL

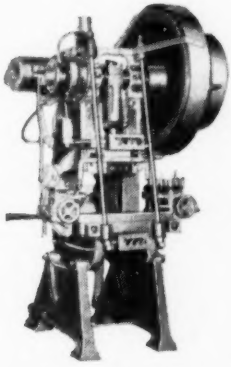


3G HORN PRESS
WITH ADJUSTABLE TABLE



No. 55G WITH ADJUSTABLE BED PRESS.

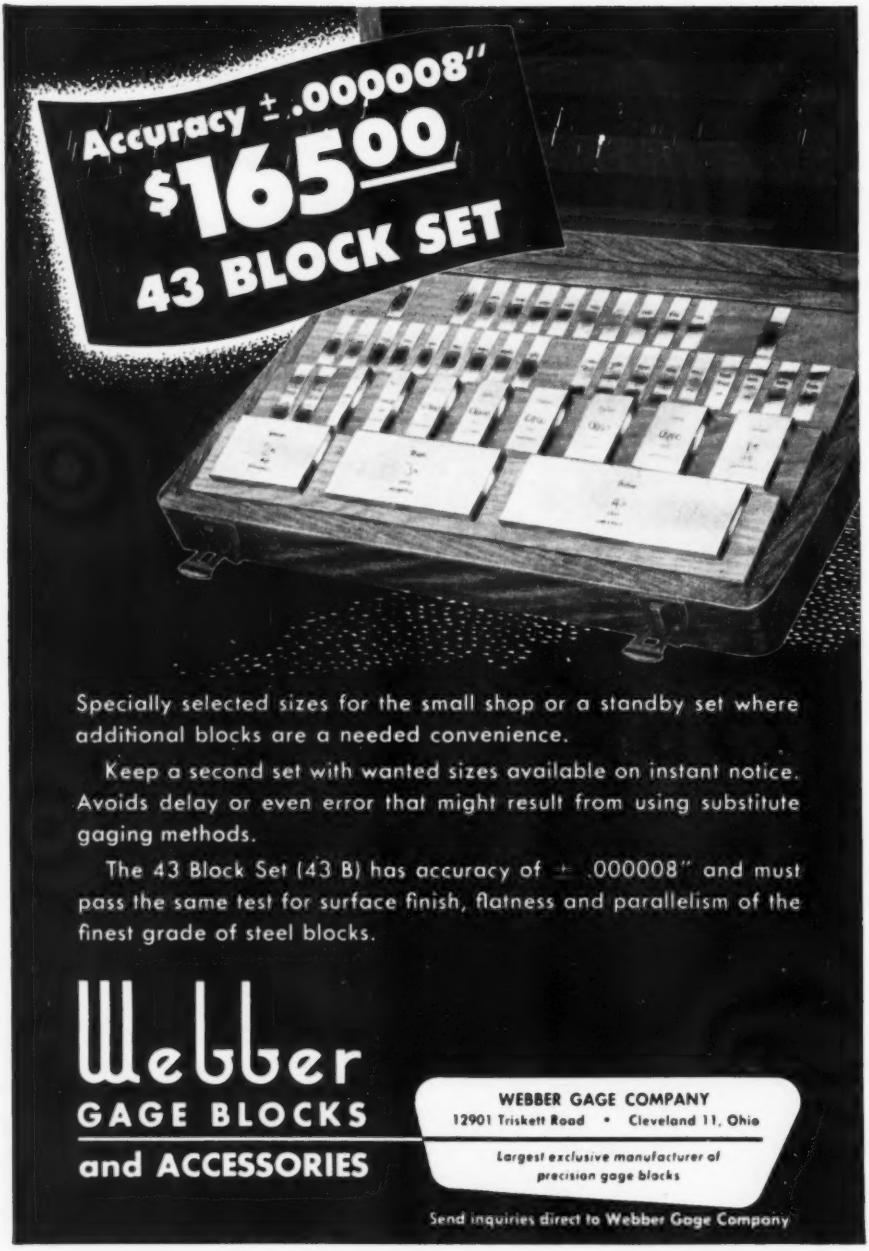
Illustrating a few of the many types and sizes of standard Perkins Presses. Presses built to customers' special specifications.



No. 450B WITH AIR CLUTCH, VARIABLE SPEED DRIVE AND DOUBLE FEED ROLLS.

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS



Specially selected sizes for the small shop or a standby set where additional blocks are a needed convenience.

Keep a second set with wanted sizes available on instant notice. Avoids delay or even error that might result from using substitute gaging methods.

The 43 Block Set (43 B) has accuracy of ± .000008" and must pass the same test for surface finish, flatness and parallelism of the finest grade of steel blocks.

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Item B-318

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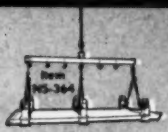
Item B-470

BARREL and BOX SKID



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SHEET STEEL GRAB

Item C-465

$30.25

Vertical DRUM LIFTER

For handling open and closed steel drums in vertical position, by crane or hoist. All-steel, with heavily welded chain. Sure-hold safety barrel grip. Saves plant space. Use for either high or low ceiling condition.

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Heavy Duty
BAR RACKS
Any Rack Easily Accessible

Item C-497

Item B-205

Item B-539

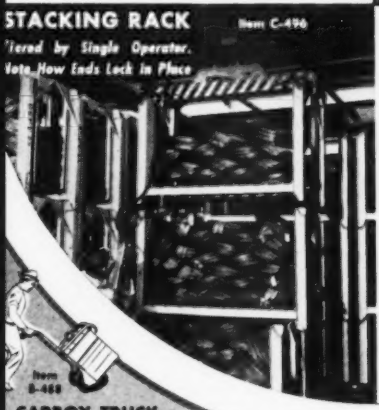
All metal PALLET

Item 50975

AIR SAVER leak proof AIR VALVE

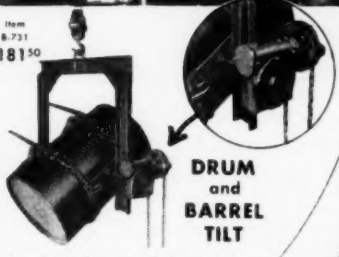
STACKING RACK Item C-496

Tiered by Single Operator. Note How Ends Lock in Place



Item B-488

CARBOY TRUCK



Item B-731

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A barrel tilt for controlled, precision dumping or pouring. Ideal for chemicals, solvents, powders, etc. Turns 360° through worm drive. Equipped with two safety type locking devices and all-steel, welded yoke. Hand-operated chain drive.

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Item C-688

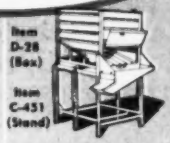
Automatic END DUMP

Item S-918

CORE RACK

Item NS-415

UTILITIES RACK on wheels



Item D-28 (Box)

Item C-451 (Stand)

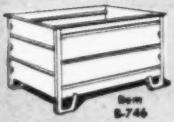
Sloped Bottom BOX and STAND

Item S-911

BARREL TRUCK loads automatically

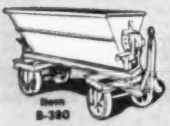
Item B-391

MULTI-PURPOSE CART



Item B-746

CORRUGATED BOX with legs



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TRAILER TRUCK side dump

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The Clausing 6300 Series has every advanced feature that contributes to machining speed and efficiency. 1" collet capacity — 1⅜" bore — forged steel spindle with tapered, key-lock nose—Timken tapered roller bearings — quick change gears — heavy duty bed. 8 speeds, 50 to 1300 RPM. 12¾" swing over bed, 7½" over saddle. 24"-36"-48" between centers. See the Clausing 6300 at your Atlas-Clausing distributor's.

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A-1, A-3, A-11 ..... 60 cents each

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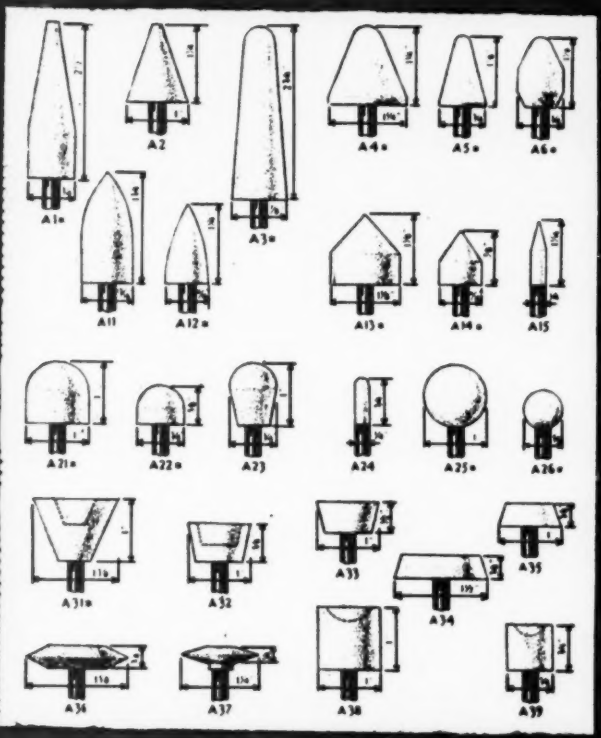
(All stones graded 24Q. Free sample on request)



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Quick and Easy

View of Pines Semi-Automatic in large aluminum plant bending extruded automobile window frames. Output easily meets production line capacity.

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FOR PRODUCTION, SHORT-RUN AND MAINTENANCE JOBS, *YOU'LL LIKE THESE PINES FEATURES*

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3 Easy to Set Up and Operate — simple tooling adjustments, easy toggle clamping, push-button operation, convenient hand wheel for angle-of-bend selection.

4 Saves Floor Space — compact, self-contained hydraulic unit includes motor, pump, reservoir. Occupies less floor space — 3′ x 7′.

SPECIFICATIONS

- Std. Max. Capacity — 1" O.D. 16-ga. steel tube.
- Max. Rad. of Bend — 8½" to centerline.
- Tube Lengths — up to 5 ft. std. (Provision for longer lengths if required).
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- Working Height — 35".
- Motor — 3 hp.
- Pump — 7 gpm.
- Optional — Adjustable gauges, mandrel for critical bends.

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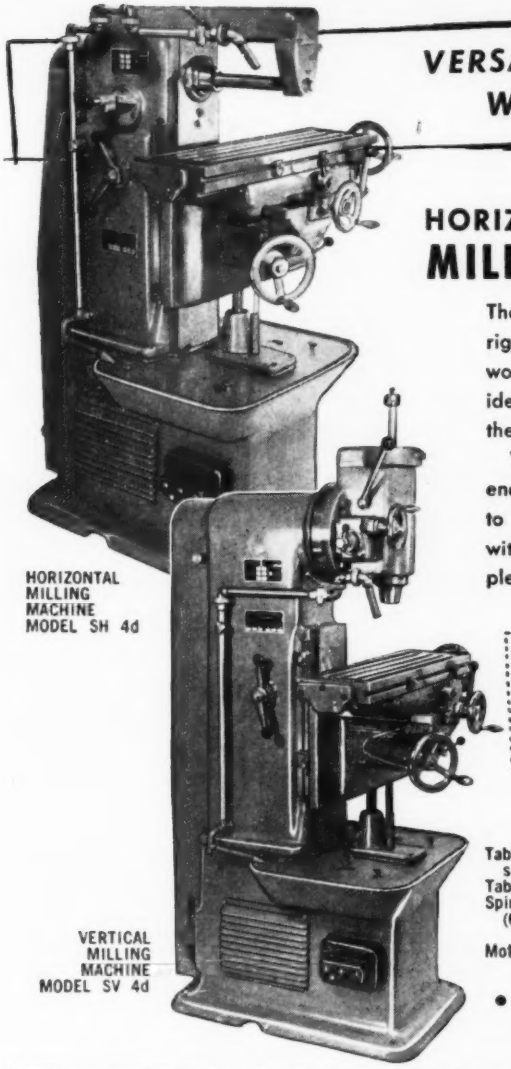

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You'll find that ease of operation enables the Steinel Milling Machines to handle a large variety of work with efficiency, accuracy and complete dependability.

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Over 200 Machines Delivered To Satisfied Users!

PARTIAL SPECIFICATIONS

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Table working surface	24"x7¾"	24"x7¾"
Table traverse	11½"	11½"
Spindle speeds (6)	40-400 rpm or 63-630 rpm	85-852 rpm or 134-1344
Motor	1 or 1½ HP	1 HP

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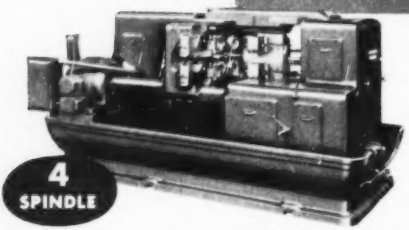
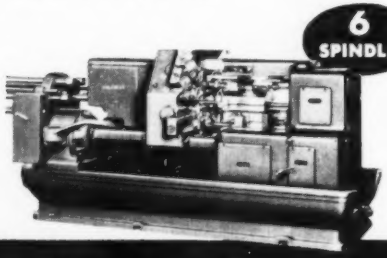
Automatic Screw Machines

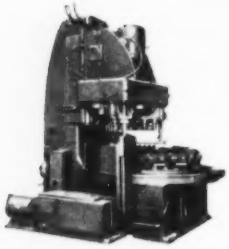


The Greenlee "Six" is available in 1", 1-5/8", and 2" capacity — the "Four" in 1-5/8" and 2-5/8" capacity. This range covers the majority of all machine-shop needs.

Greenlee Machines feature maximum economy of operation on short-run as well as long-run jobs . . . because of quick change-over, wide-open tooling area, great versatility, low tool cost, and a wide variety of accessories.

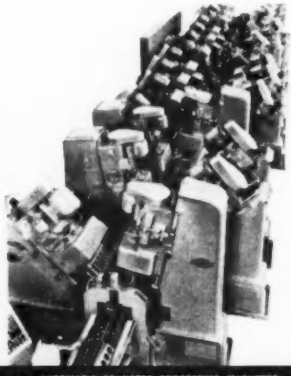


GREENLEE



The first Greenlee "special" machine was designed and built in 1918, and Greenlee was also a pioneer in the development of automatic transfer machines now widely used in the mass-production industries. Greenlee machines are made up of *proved* units and mechanisms, specially combined to perform specific work . . . consequently, they show remarkably good performance right from the start of their operation.

Special Machines



Descriptive literature available upon request.

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GREENLEE

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1840 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

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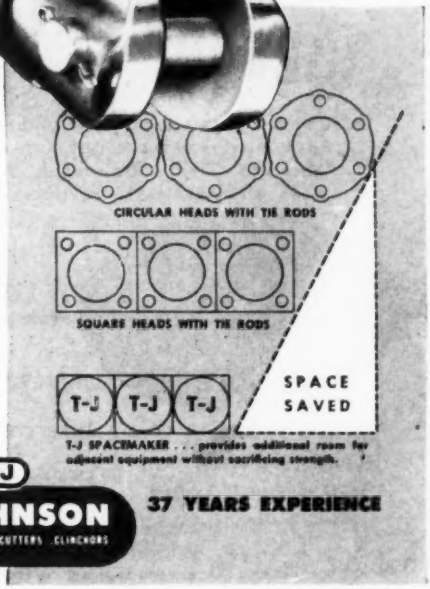
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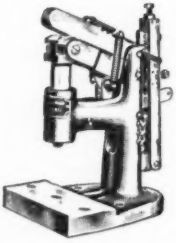

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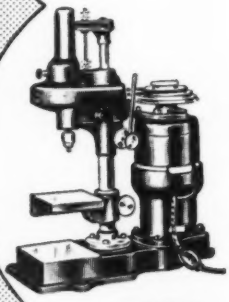

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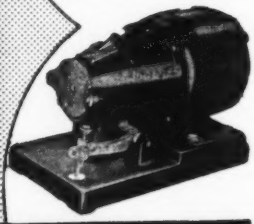

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Featured IN THIS ISSUE

New Studies Show Errors in Many Present Tooling Practices **157**

Machining Nickel Alloy Steels **164**

Which New Material Shall I Use? **208**

New Studies Show Errors in Many Present Tooling Practices, by Clifford T. Bower. Many tool designers use components from long habit and without regard for their actual efficiency. Studies have beeen undertaken to determine which components are actually the most desirable to use from a production and economy standpoint. Findings of these studies are reported by the author. Page **157**

Machining Nickel Alloy Steels, by G. P. Witteman. Factors which affect steel workability are: cutting conditions including feeds and speeds; design of cutting tool; capacity and rigidity of machine; structure of material being machined; cutting fluids. These factors are analyzed in the present article on the machining of nickel steels. The author has prepared considerable material on this subject for the International Nickel Company. Page **164**

Kneading Die Produces Steel Type Rapidly, by Herbert Chase. Channel shaped blanks held on an indexing fixture are brought under a punch that is rocked at the same time that pressure is applied. Output nearly doubles that formerly attained. Page **195**

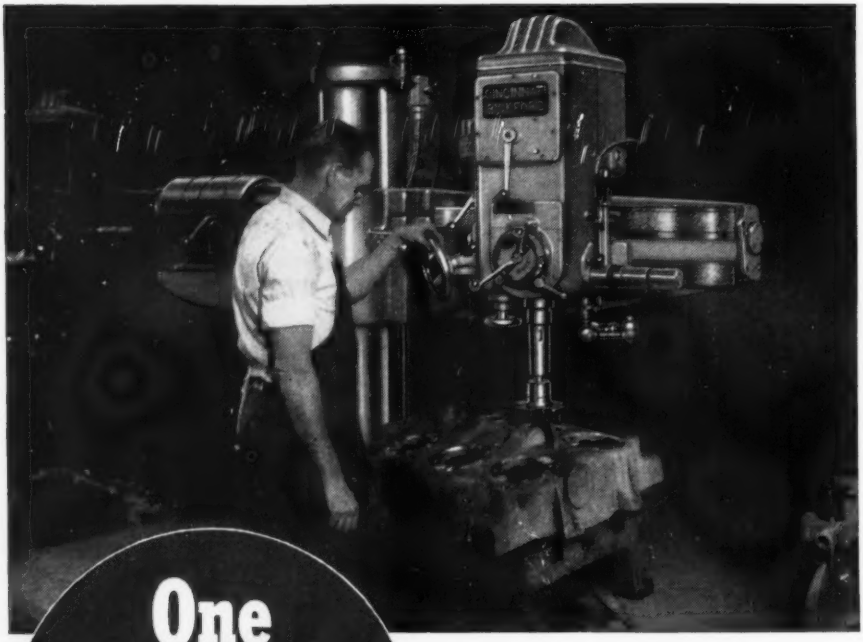
New Trimmer Saves Operation, Lowers Tooling Costs, by Paul Anstedt. This trimmer produces irregular stepped contour on sides of drawn stamping in one stroke of machine with marked reduction in labor charges. Roll type beader is also employed with noteworthy results. Page **203**

Which New Material Shall I Use? . . . A Summary of Recent Developments, by Julius J. Harwood. So many new materials have come into use during the last few years that the designer is hard pressed at times to determine which material will exactly meet his needs. A summary of latest materials available for the designer and metalworking executive are discussed by the author. This is part 1 of a 2 part series. Page **208**

BLUE BOOK's "Know-How" REFERENCE SHEETS. Included in this month's Reference Sheets are: Typical Heat-Treatments for Carburizing Grades of Alloy Steels; Typical Heat-Treatments for Directly Hardenable Grades of Alloy Steels. Page **237**

How Your Foreman Can Make the Most of Your Conference Meetings, by Edmund Mottershead. Conferences are becoming more and more important. They represent an investment on the part of management and workers. How best results can be obtained from the handling of a conference is discussed by the author. Page **247**

Special Report Number 34. This continues the present series on Grinding Machines. Featured this month is an article on surface grinding, by Albert I. Palm. Also featured are descriptions of late model grinding machines and specifications of American-built surface grinders. Page **268**



One set-up saves 30%

Photos courtesy of the Kelman Electric & Mfg. Company, Los Angeles, California.

Boring, facing, and high speed drilling with one set-up cut the floor to floor time about one-third on this job.

The Kelman Electric & Mfg. Company say their Cincinnati Super Service Radial Drill "handles easily, is very accurate and versatile."

They are facing 6" diameters, drilling for ½" bottom tap, and tapping with a ½" bottom tap on this job.

The part being processed is a Bronze Top Casting.

Cincinnati Super Service Radial Drills are profit makers in this shop, and they could be in yours.

Write for Bulletin R-21C

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

AS THE *Editor* SEES IT

Trim the Fat, Save the Muscle

The first law of sound business management should be intelligent frugality. A business in which the luxury of spending is viewed as a means to obtaining practical, beneficial results is a healthier operation than that business which carries about with it the dear pleasures of wasteful appropriations and extravagant expenditures regardless of maximum benefits to be derived therefrom. Frugality and intelligent expenditures are to a business what leanness and muscles are to an athlete.

But frugality is not penny pinching. Fiendishly hacking off appropriations in an effort to save money rather than as a means of streamlining production is merely hacking at the muscles of the athlete as well as the fat. No mutilated athlete ever won anything except a hospital bed; penny pinching businesses don't win much more.

When expenditures are to be made the intelligent manager asks: . . . of an expenditure for new equipment, Will it increase production? By how much? . . . of the cost of hiring additional managers, Will the managerial force achieve objectives faster? Will it release men for deployment on special projects? . . . of an advertising appropriation, Will it reduce salesmen's calling time? Will it increase sales?

When these questions are answered affirmatively the expenditure is approved. Frugality expects a just return from each investment: equipment is bought, production methods are streamlined, advertising campaigns reduce sales costs, wages are increased to reduce the expense of labor turnover, and a hard hitting, ambitious organization secures its place in the sun.

But what of the nickel and dime boys? Ah, you know them well: frugality carried to absurdity. No expenditures for new equipment, but a large maintenance crew to keep the old wrecks clanking another day . . . no well-paid managers, only mediocre talent, the intelligent and ambitious find other jobs . . . no advertising campaigns, but a high sales cost . . . no intelligent handling of salesmens' commissions, only expensive low sales volume. What, hire a firm of consultants to analyze our business? Listen, young fellow, I've been in this business for a good many years, and I guess I know how to run it. I don't hold with these fancy specialists. We're doing O.K.

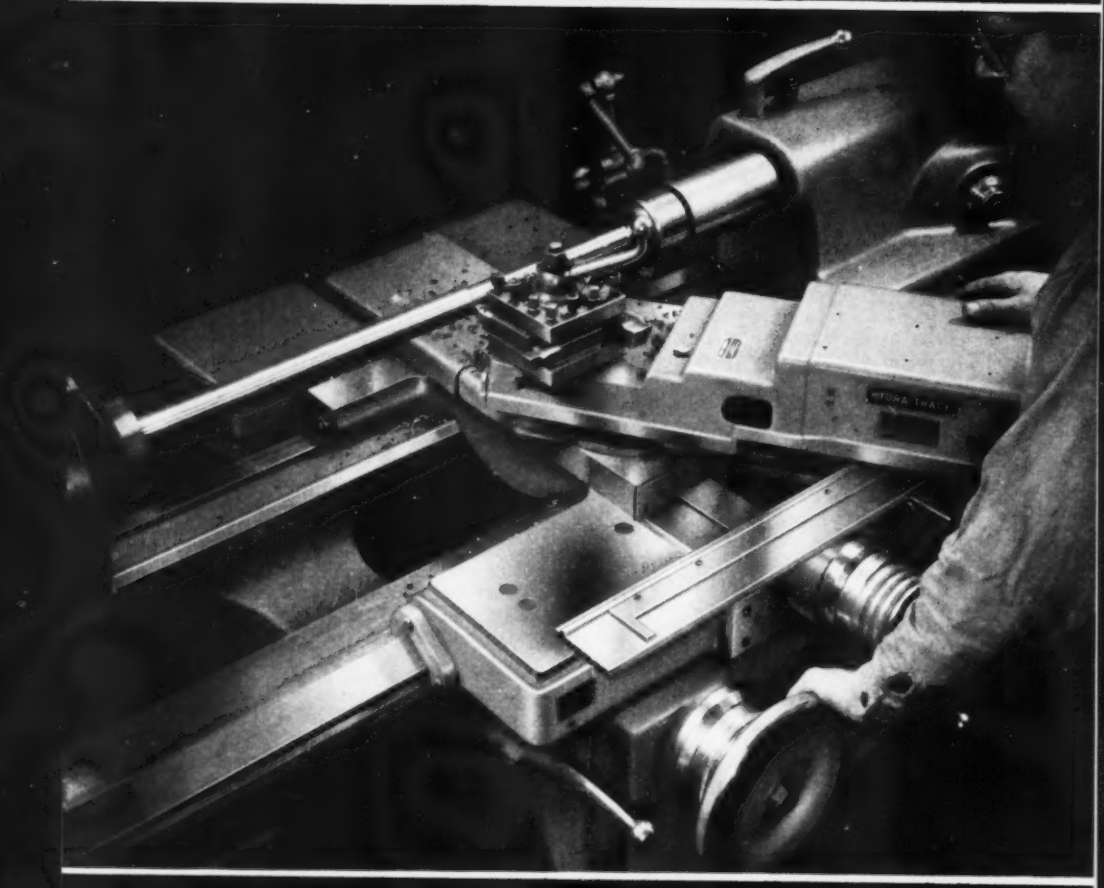
Penny pinching is a disease which spreads its poison into every vein and viscera of the body. It corrupts initiative, corrodes teamwork and causes dissension and disunity. It never results in the full development of a company.

Let us have instead, intelligent frugality. Send forth a dollar so that it may return leading little dollars by the hand. A healthier, better business will result. Hack off the fat, yes, but save the muscle.

William F. Schleicher

NOW SCULLY-JONES TURNS

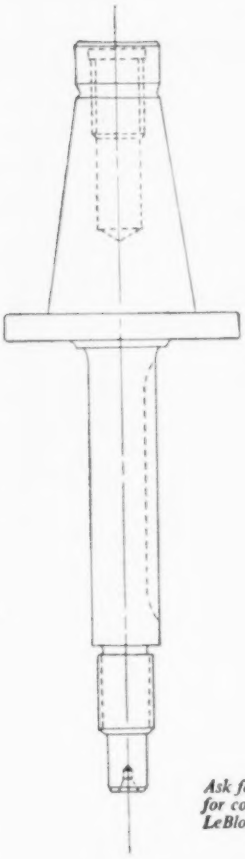
four arbors instead of 3...



Hydra-Trace (Trade Mark, Registered U.S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment can be mounted in place of the compound rest on practically all LeBlond Lathes built since 1935

same time, same lathe...

plus "Hydra-trace"*



When defense needs mushroomed demand for production equipment, Scully-Jones & Co. of Chicago found itself jammed with orders for milling machine arbors (they make more arbors than anyone else). Acting on advice from engineers at LeBlond's Chicago Office, Scully-Jones added Hydra-Trace to their LeBlond 16" RT Engine Lathe. Now they turn out four arbors in the time formerly needed to produce three—same lathe, plus Hydra-Trace.

Besides boosting output, this template-controlled hydraulic tracer saves 45% on set-up time, gives uniform precision without the need of a highly-skilled operator.

Stepless form-turning, contour facing, and turning step shafts are all in a day's work for Hydra-Trace. *Fits all LeBlond Engine Lathes built since 1935*, can be mounted easily in a matter of minutes. Templates are flat, compact, suitable for both rough and finish turning. They can be produced readily in your own plant, stored in limited space.

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LAST MINUTE WASHINGTON NEWS

★★★

by Arnold Kruckman

Washington Correspondent

An absorbing topic of discussion in Washington concerns the paramount problems that will engage the major attention of Congress at the next session. There is every likelihood that one of the very first to be taken up will be the Air Force. That is a subject which is very likely to set the country by its ears. It is curious that it has not yet become an emotional issue, except among the professional Armed Forces people. The story goes somewhat this way. Responsible and authoritative military people can give you chapter and verse and exact numbers for the air equipment of the Russians. They will tell you that the Russians now exceed us by staggering figures in every type of fighting aircraft. You will be told that they have ten times as many ultra dangerous offense craft poised at a certain place in the north, which could reach every important industrial center in the U.S. because our defense craft, according to these experts, are pitifully out-numbered. They point out that our centers of aircraft and munitions production could be destroyed to such an extent that we would not be able to get back into production for eighteen months to two years.

The point, of course, is that we are spending grotesquely too much on land armies which, in the opinion of the air experts, are virtually outmoded in the next great war. Undoubtedly by the time this is published, considerable fuel will have been added to this debate by reason of the just announced reduction of the aircraft program by at least a thousand planes. You will probably hear, sooner or later, that there is a very considerable body of expert military opinion which holds that the military thinking of Eisenhower, Bradley, Collins and others of the immediate past, and some of the present top-level directors of our military destiny, is passe. You will be told that they fatally under-estimate the potential of air war—that they still think in terms of vast armies, plus the great projectile throwers, and other fixed equipment. When you ask, if the Russians have such a great advantage, why don't they start something? The answer is that they are waiting until their stock of H-bombs and A-bombs has reached a certain number; and

CLUTCHES by ROCKFORD

This Lathe "Works Both Ends Against The Middle"

The Lodge & Shipley DUOMATIC LATHE features independently actuated front and rear carriages and tool slides; permitting simultaneous or independent operation of the front and rear cycles. ROCKFORD CLUTCHES both drive and brake the main headstock drive. Let ROCKFORD clutch engineers help plan versatile power transmission controls for *your* machines.

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ROCKFORD CLUTCH DIVISION BORG-WARNER

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it is generally suggested that the desired number will be reached sometimes during 1954, which of course, for sometimes past, has been the crucial period in the minds of military men. Incidentally, those of the school of thought reflected in this letter also point out the huge numerical superiority in manpower of Russia and its satellites. They particularly stress the colossal resources in China and other Asiatic countries which are available to the Russians. And it should be stressed that the picture outlined here does not come from irresponsible, unqualified persons. It therefore warrants, at least, consideration in any thinking about the future.

* * *

Another subject which will have much discussion is Government competition with private industry. Congressman Wint Smith of Kansas thinks it will be second in importance. Recent hearings by various Committees have revealed that practically every major part of the Federal Government, in some way or another, has engaged in some form of production or commerce which is supposed to be the sole business of the citizen. In one hearing those who appeared for various industrial firms startled the Committee by conclusively proving a numberof business firms have been driven out of existence in various parts of the country by the Government competition. In another hearing a regular parade of retailers proved that the PX shops in Government Reservations caused the closing of retail stores in the neighborhood of the Government installation. It was found that a large number of persons in the neighborhood bought their supplies in the Government Reservation without let or hindrance from the soldiers or sailors orair men who staffed the PX shops. And it was demonstrated that the Government shops virtually were a sort of a giant store which carried practically everything that the householder might need. It should be borne in mind that these Government retail stores are staffed by personnel that receives only the regular military wage, they sell their wares without paying taxes, they procure whatever they sell at the best possible wholesale price, and they have practically none of the usual overhead charges that must be carried by the civilian retailers. The diversity of the enterprises in which the Federal Government is engaged in competing with private industry and private selling is almost as great as industry and business is various. In the majority of cases it was found that the civilian government agencies operated whatever industry or business in which they were engaged without authority, and used funds which were appropriated for wholly other purposes. Of course they covered misuse of their funds and authority by some vagueness in the Appropriations Act, or by some distortion of the regulations under which they were operating.

* * *

The new Hoover Commission has as part of its task a thorough exploration and appraisal of Government competition with private business, and will undoubtedly make recommendations. There are also other Committees which will hold hearings before the first of the year, and it is expected a number of bristling reports will be made to the next session of Congress. There also will be a number of reports having to do with Social Security which is expected to parallel Government in business in Congressional interest. The Social Security topic involves complete revision

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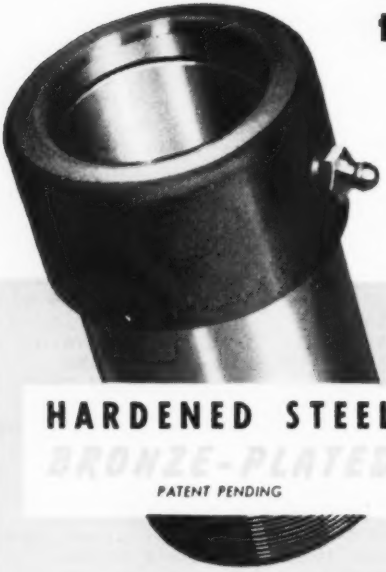

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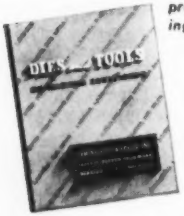

Lamina

DIES AND TOOLS

if the House Ways and Means Subcommittee Representative Carl T. Curtis(R., Neb.), has its way. Representative Curtis' Subcommittee will begin a new series of hearings in November. What has gone before indicates that the Subcommittee is re-examining fully the fundamental conditions on which the Social Security law is based. It is known that officals of the Bureau of the Census, and the Bureau of Internal Revenue, told the Committee that future population trends cannot be accurately predicted because of a reversal of a long-term trend in the birth rate; and that the present tax laws are inequitable because they give some ten million employed persons definite tax advantages over the self-employed. The Subcommittee found that there had been significant estimates of the Social Security law. For example, miscalculations in projected census figures used in the original 1,934 estimates of actuaries placed the 1950 population at about 141 million; of course the actual total in 1950 exceeded 151 million.

It has been suggested that the Social Security system should include a "pay as you go" tax program to support it. Until the Curtis Subcommittee reports in December it is not known whether the tax rate in January should be 1%, 1½%, 2% or or even more, there are 170 bills in the House Ways and Means Committee calling for all kinds of Social Security reforms. The Curtis report will carefully consider the demand that has been made to abolish Federal Social Security and to return the entire Social Security system to the States. It is reported it has been demonstrated by actuaries that State operation of Social Security would make vastly more funds available for Social Security, in the States and for the beneficiaries. Of course, under present circumstances, the funds are collected from the States, and then are distributed either to individuals or to the States, which revisionists will show entails much waste.

* * *

Naturally the Bricker Amendment to limit treaty-making powers, so that any treaty cannot at home contravene the law of the land, also will become a top subject in Congress next session. When you discuss the Bricker Amendment with top-shelf Republicans such as C. D. Jackson of the White House and member of the high command in the State Department and on the Hill, you are impressed with the fact that they are utterly convinced they will have the Bricker Amendment stopped in the next session. Apparently every devise, known to paralyze the indidual Member of Congress, and the entire body of Congress in political action, has been used and will be used. Those who originally were sincerely and overwhelmingly for the Bricker Amendment have voted against the principle in test votes. It is known that many who received a deluge of mail and calls in behalf of the Bricker Amendment, ultimately also received peremptory demands to vote against it from banks, and from their commercial associates and from those who have it in their power to thwart their political ambitions either through the local machine or through their financial backers. Whether an overwhelming demonstration by popular clamor will push it through is very uncertain. Tied to the Bricker Amendment is a whole flock of foreign policy considerations, including modification of our relations with the UN. It would be unwise to underestimate the

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PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

bitter hatred that apparently is growing in the country for the UN. And there are sweeping indications that the feeling is growing that the U.S. should cut down its support of foreign nations. One Congressman who made a painstaking study of what the people think about the funds we give them, both in Europe and Asia, reported that actually only a handful of people knew that we were doing what we are doing, and that we are constantly growing more unpopular. This Congressman believes the country is drifting again toward isolationism.

Another subject that is expected to raise blood pressure is the discussion of the Taft-Hartley Act. The Labor Unions are going to force its consideration. On the other hand, employers and management generally also want changes in the Taft-Hartley Act; but they do not want the changes that the Labor Unions demand. The conflict will provoke a noisy battle in Congress. Incidentally, every one on the Hill admits that the calm, wise and high-level leadership of Senator Taft will be tragically missed. It is generally the comment that the genuine greatness of stature of the man, normally and ethically and politically, has never been so apparent as since he has gone. His utter integrity now shines as one of the phenomena of this time.

* * *

Obviously, taxation in all its forms will come up for discussion, even if the President's Commission and the Congressional Committees have not finished their surveys and investigations. The pressure to do something about taxation is so great that the Members of Congress will be obliged to make some gesture, even if it is only a dress rehearsal discussion, to appease the voters. One of the curiosities in the Congressional tax web is the attitude of Senator Harry Byrd. Senator Byrd is regarded as one of the foremost specialists in the fiscal affairs of the Government. When he speaks they accept his facts even before they accept what comes from the Treasury or from some other fiscal agency. For instance, recently he reported that there was $118.1 billion unexpended in the Treasury and that the Defense Department had $71.9 billion left over from its last fiscal year. He showed that funds available to all Federal agencies for the year ending June 30, 1953 totaled $177.7 billion, which included $96.8 billion in regular carry-overs and $80.9 billion in supplemental appropriation carry-overs. Yet, while Senator Byrd has these extraordinary resources of facts, they will tell you on the Hill that he will never lead in proposing a specific positive tax or fiscal Act. He apparently acts in negative equations as opposition.

* * *

Congress wearily anticipates that the Hawaiian and Alaskan Statehood propositions again will come up with determination and drama. It will take much of Congress's precious time. Yet, While Congress cannot afford to waste time, with all the serious things it has to do, the Statehood proposals unquestionably will consume weeks in hearings and debates. Neither Alaska nor Hawaii is expected to attain its desires.

* * *

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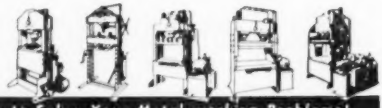

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How's BUSINESS ?

Review of National Income and Product in the Second Quarter

According to the Office of Business Information of the U.S. Department of Commerce economic activity continued at a brisk pace in the second quarter, with gross national product rising to an annual rate of $372 billion—about $10 billion higher than in the preceding quarter. Most of this rise represented a larger physical volume of production as overall prices showed only fractional increases.

This record output of goods and services was reflected in the extensive use of the Nation's labor force. By the quarter's end, civilian employment had reached the unprecedented total of 63.1 million persons, as compared with 62.6 million in June of last year. Unemployment, in turn, was down to a minimal rate of 2.4 percent of the total civilian labor force. The average number of unemployed, slightly less than 1.5 million in the spring quarter, was 10 percent below the same period a year ago.

Personal income, which measures the total payments to persons for productive activity plus transfers from Government and business, was at an annual rate of $284½ billion, compared with $281½ billion in the opening quarter of the year and with $266 billion in the second quarter of 1952.

Final expenditures in most sectors of the economy either registered further moderate advances or maintained recent high rates. However, in contrast to the situation in the first quarter, a substantial portion of the increase in national output in the second quarter was absorbed in business inventories. Net inventory investment has been subject to wide variations since mid-1952—following in the wake of last year's steel strike—and while it is not yet fully evident to what extent the second-quarter accumulations were planned or unplanned in character, it is believed that they represented, for the most part, a filling out of stocks in support of increased business activity. At the end of June, it may be noted the total value of nonfarm inventories was roughly $3 billion higher than at the beginning of the year.

Final Purchases Continue to Rise

Although the advance in total final purchases had been exceeded in the preceding two quarters, the economy at that time was making up the ground lost during the steel shutdown last summer. These temporary backlogs were substantially eliminated as an element in the second quarter increase.

National security expenditures increased somewhat more in the April-June period than in any of the three preceding quarters—advancing about $2 billion at annual rates. The rise in consumer spending was somewhat larger, and equaled about three-fifths of the $4½ billion increase (annual rate) in total final purchases. Private new construction and capital equipment expenditures together moved up an additional billion dollars on an annual rate basis. Partial offsets in the total were provided by declines in net foreign investment and total civilian purchases of Federal, State, and local governments.

It is noteworthy that total consumer purchases in the second quarter were $13 billion above the $217 billion annual rate of the second quarter of 1952. This sizable increase was about the same as that which occurred over the preceding year (second quarter 1951 to second quarter 1952). This fairly steady uptrend in aggregate consumption expenditures has been asserted in spite of considerable shifts in their composition (seen most clearly in the sharp fluctuations in consumer durables) and variations in the rate of change in disposable personal income.

Farm Income Off

Agriculture continued to run counter to the generally favorable business trend in the second quarter. This adverse tendency in reflected in the continued downward drift in the net income of farm operators.

Domestic consumption of farm products has remained firm but, with the heavy volume of farm marketings and the decline in foreign sales, farm prices have been under fairly steady downward pressure. The situation was further aggravated during the past quarter by the serious drought in the Southwestern States. This gave rise to accelerated shipments of cattle to market, causing further softening of livestock prices.

Demand for Gross National Product

Personal consumption expenditures rose in the second quarter of 1953 to $230½ billion, at a seasonally adjusted annual rate—up $2½ billion from the preceding quarter. Higher income generated by the continued expansion of economic activity provided the primary impetus. In view of the relative stability of consumer prices, most of the advance represented an increase in physical volume.

Consumption Expenditures Firm

The general firmness of this basic sector is suggested by the fact that over the past three quarters consumer expenditures have more than kept pace with changes in disposable income. However, in the fourth quarter of 1952 as well as in the opening quarter of this year, a large part of the step-up in consumer buying had represented carryover demand from the strike-affected third quarter of last year. This factor was noticeable particularly in automobile expenditures, and, to a lesser extent, in the purchases of various categories of home equipment.

Durables Show Mixed Movement

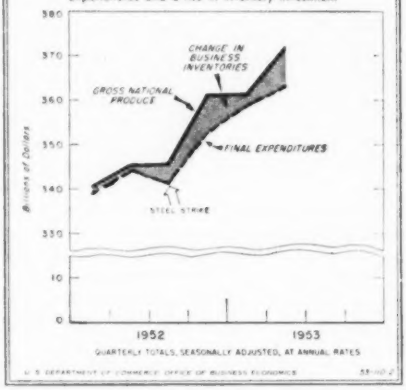
Consumer outlays for durable goods advanced to a $31 billion annual rate in the second quarter, making the half-year total ending in June the highest since the second half of 1950, when the post-Korean buying wave was at its peak. Of the major hard goods categories, only the miscellaneous group—which includes such diverse items as jewelry, watches, tools, books, and sport equipment—is currently higher (about 10 percent) than in the second half of 1950.

Consumer purchases of automobiles and parts rose to an annual rate of $14½ billion in the April-June period. The increase of $1 billion over the preceding quarter continued—though at a diminished rate—the strong advance from the third-quarter 1952 lowpoint. With new passenger car output up to 3¼ million units in the first half of 1953, production has been adequate both to supply the peak seasonal demands for new cars and to build up dealer's stocks. After rising sharply in the first 4 months of the year, these stocks have tended to level out—reflecting in part the effects of the scattered work stoppages in the automotive parts industries which hampered passenger car assemblies in the latter part of May and in June.

Consumer outlays in the broad furniture and household equipment category fell back from a $12½ billion annual rate to a $12 billion rate during the past quarter. With lagging sales and mounting inventories, manufacturers cut back production in many of these consumer hard goods lines. The sharpest cuts were in the television and radio group, where production had soared to unusually high rates in the preceding half year. The reductions in major household appliances were much more moderate percentagewise. Furniture production, in contrast, continued its

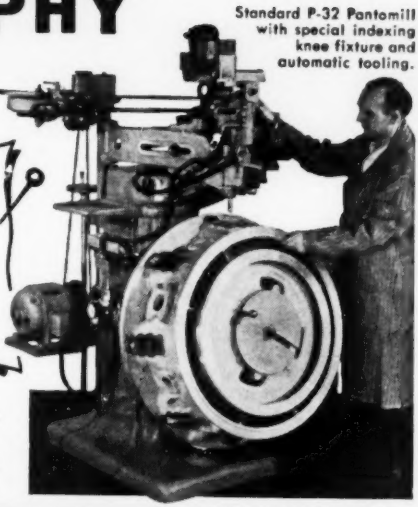
Close-up of Gross National Product Movement Since First Quarter 1952

Second quarter 1953 change in gross national product reflected a further advance in final expenditures and a rise in inventory investment



PANTOGRAPHY

Solves Complex Profiling Problems with Automatic Cutting Cycle



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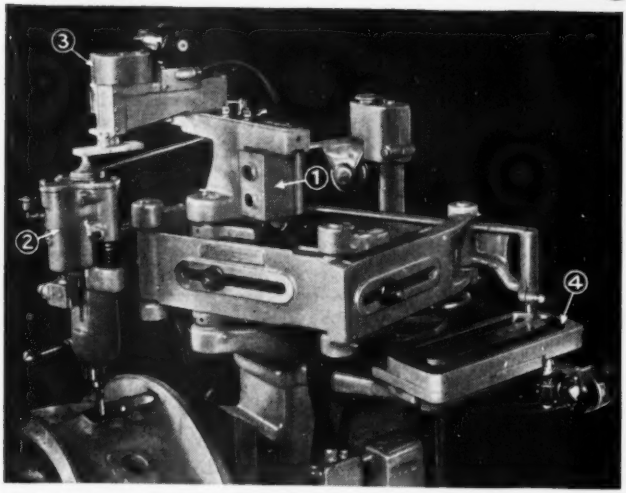

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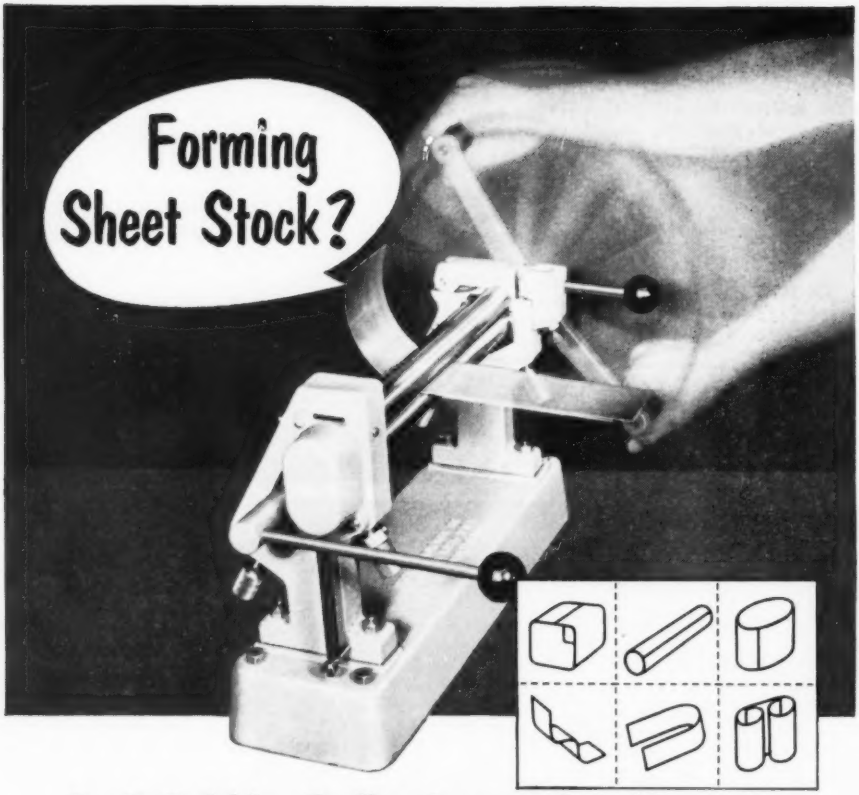

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gradual uptrend through the second quarter of this year.

Rise in Nondurable Goods Inventories

Nonfarm business inventory accumulation increased from $2½ billion on an annual rate basis in the first quarter to about $8½ billion in the second. The major part of this increase was in durable goods, although the rise in this segment was somewhat less than had occurred in the first quarter.

Contrary to developments in the March quarter, nondurable goods accounted for a substantial part of the overall inventory advance. The increase in such stocks, however, sufficed only to offset the net liquidations that had occurred over the course of the preceding 6 months. As a result, the June aggregate of nondurable stocks in manufacturing and trade combined was about the same as in September of last year.

Industrially, about two-thirds of the second quarter rise in business inventories occurred in the manufacturing sector. In both the durable and nondurable industry groups, it is important to note, the increases in inventory holdings were accompanied by larger percentage increases in aggregate sales.

The bulk of the rise in manufacturer's stocks was in the durable goods industries, where the rate of accumulation was about double that of the prior quarter. In addition to the increased volume of sales, a number of other factors contributed to this rise. Among these were the moderate increase in replacement costs, the imbalance in the automobile industry due to work stoppages in various auto supply plants, and some accumulation of consumer durables in the electrical machinery group.

Metal Industries Stock Up

Additionally, there were indications of moves to stock up during the quarter in anticipation of the effects of the steel industry's collective bargaining talks which began in May. In this connection, industry reports indicate that most steel-using manufacturing industries customarily seek to maintain a 2-3 month supply on hand against current operating needs. Due partly to the effects of the former NPA inventory controls which were made necessary by the stringent supply situation during the earlier phase of the defense buildup, and partly to the steel stoppage last summer, many firms were still actively engaged during the quarter in building up their stocks to former operating levels.

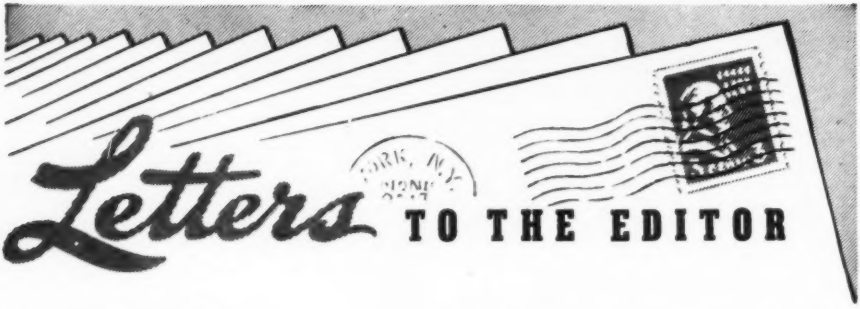
The inventory increase in the soft-goods industries, which accounted for about one-fourth of the manufacturing total, did not offset completely the declines of the preceding 6 months.

Bulk of Trade Rise in Nondurables

The second-quarter increase in inventories in nondurable goods retail establishments restored about three-fourths of the stocks that had been liquidated in the preceding 3 months. The changes in the different lines of trade were on the whole relatively moderate. The general merchandise group, however, ran counter to most of the soft-goods trades in registering sizable inventory advances in both the first and second quarters of the year.

Retailers' durable goods inventories continued to advance in the June quarter. Although less than half as large as the net accumulation in the first quarter, the increases in retail durable stocks were pervasive and appear, to some extent, to have been involuntary. Some evidence for this is found in the moderate reductions of consumer spending in the non-automotive lines, as well as the cutbacks noted above in the production of radios, television sets, and various other items of household equipment.

"Now tell me my work stinks."



Machining at 1000 S.F.M.

In the July issue of your magazine there was an article entitled, "Machine SAE 8620 at 1000 S.F.M. on Production Jobs," which is just what I need for top management and the time study and methods engineers. If at all possible, I would appreciate receiving a dozen reprints for distribution.

B. K. Corman,
Time Study Engineer
The Gallion Iron Works and Mfg. Co.

The Jones and Lamson people, who are running some jobs at this high S.F.M. rate, have done quite a bit of work with machining at high speeds. Results have been excellent and the benefits resulting from such speeds are not confined solely to increased production but also include better finishes, cooler work, less surface metal destruction.

Reprints have gone forward to reader Corman. Unfortunately, the demand for back copies of July have been so heavy that we cannot send as many as requested.

Method of Hobbing Worm Wheels

In reading the August issue of MACHINE and TOOL BLUE BOOK I noted on page 185 a title and description of a method of hobbing worm wheels without preliminary gashing by Mr. Tom Brown, consulting tool engineer.

I would like to call your attention to the fact that this method is not new and was used by the writer as early as 1920, using the standard rotary turn table from Kearney & Trecker milling machine, along with the knee attachment which is a standard accessory with the above-mentioned machine. However, change gears were furnished with the knee attachment for setting up the various ratios between the milling machine spindle arbor and the 40:1 ratio turn table so that worm wheels of various numbers of teeth could be cut.

My object in passing on this information is that through your magazine it may be possible to impart this information to the trade and that those companies who may have milling machines equipped with turn tables and with the nominal investment in the knee mechanism, could produce the same work as that described by Mr. Brown.

A. Hollmann, Project Engineer
Universal Match Corp.,
Armament Div.

Our thanks to reader Hollmann for his kind interest in passing along his method of hobbing worm wheels without preliminary gashing. His interest is appreciated. The information has been passed on to Mr. Brown.

Would you please give us the address of Mr. Tom Brown, the author of your feature article, "Milling Setup for Worm Wheels" on page 185 of the August issue.

We would like to send some information on a special German machine which automatically does the same type of work he discusses in his article.

Harold W. Jones
Vice President
Kurt Orban Co., Inc.

Mr. Brown's address has gone forward to reader Jones.

Procastination is the . . .

. . . I happened to be looking through "Letters to the Editor" and saw the discussion in regard to the quotation "Procrastination is the thief of time."

I looked this up in my Bartlett's quotations. . . . According to this book, this quotation is by Edward Young but is from, "Night Thoughts," line 393.

A. F. Davis
Vice President
The Lincoln Electric Co.

In the Letters to the Editor, August BLUE BOOK, this quotation was attributed to Edward Young. We said the quotation was from, "The Complaint." Reader Davis is correct and his Bartlett did not let him down; at the same time we are also correct. The complete title of the poem is, "The Complaint, or Night Thoughts on Life, Death and Immortality."

Who . . . When . . . and Special Reports

Representing the Standards Department may I inform you that each member of the department reads BLUE BOOK and continuously finds it extremely interesting.

Reading Letters to the Editor, I became interested in the comments on the card, Who and When. I would appreciate receiving several of the signs for placement in our plant.

Report No. 32 on grinding is also of much interest. During the time that you present the articles on grinding I would be interested in knowing whether you intend to present any articles on Surface, Rotary, External and Internal Grinding. If so, will you be specific as to feeds, speeds, and wheel wear on various materials? Any information you can forward to me will be greatly appreciated.

Everett Franzson
Supervisor Standard Department
S & S Corrugated Paper Machinery, Co., Inc.

All types of grinders will be discussed before the grinding series is exhausted. It is to be hoped that when the entire series is finished all the information requested by reader Franzson will have been included. Who . . . When cards have gone forward.

Drilling Report

MACHINE and TOOL BLUE BOOK, during the past year, has carried a series of reports on drills and drill grinding.

Will you please advise me how I could obtain copies of these reports.

Richard W. Crannell
Vice President
Lehigh Foundries, Inc.

Copies of the drilling report have gone forward to reader Crannell.

Several weeks ago I read a pamphlet reproduced from your June to December, 1952, issues. This pamphlet was entitled, "Drilling Machines". I hope these are available for distribution.

Kindly forward to my attention 12 copies of this pamphlet and render your invoice to Masback Incorporated.

I might add that I have seen many papers prepared on Drilling, yet I feel that your reprint and condensing of this material is an excellent job.

H. A. DeVoe
Masback Incorporated

Reprints of the drilling reports have gone forward to reader DeVoe with many thanks for his comments. There are only a few copies of this 140 page booklet available. Single copies are free; for more than one copy we charge the cost of producing this reprint.

Please mention MACHINE and TOOL BLUE BOOK when answering advertisements, or use the handy Readers Service Card on page 64.

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New Studies Show Errors in Many Present Tooling Practices

By **Clifford T. Bower,** Consulting Engineer

SEVERAL FACTORS decide the type of elements which are incorporated by tool designers in their jigs and fixtures. Space, cost, accuracy requirements and speed of operation have to be considered when choosing such items as drill guide bushings, clamps and location points. Many of these tooling elements have become standardized and their use has become a habit of tool designers who assume, owing to long familiarity, that they are employing components whose efficiency has been proved. Actually, many of the standardized jig and fixture elements are not as efficient as they appear to be and it is advisable that a closer look be taken at them so that they may be graded according to their fitness for certain purposes.

When designing tools for efficiency it is advisable for the designer to study carefully each detail before incorporating it into the finished tooling project. If the designer has no hard factual information about the details he will be guided in his choice by personal prejudice, since he has nothing else with which he can be influenced. If, on the other hand, the designer has information on the relative efficiencies of tooling elements, he can design tools to fit in with the over-all requirements of the specification laid down.

The best way to accumulate factual information about jig and fixture elements is to carry out simple but carefully controlled investigations and to tabulate the results obtained in the form of a table which may be referred to quickly. Such investigations can be made with simple apparatus and by one person, who can call in occasional help in the form of "guinea pigs."

An idea of the way in which such an investigation can be carried out is indicated by the results obtained on tests made to find the time to operate a few common jig and tool elements. The tests were made by the Technique of Tooling Study Group formed by the Graduate Section of the Institution of

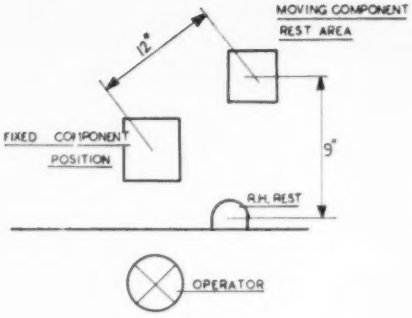


Figure 1.

Production Engineers, London, England, and are but a section of a planned extensive series of probes into the efficiencies of various jig and tool elements.

Three groups of tool elements have been investigated in this initial test and the results obtained reveal that elements which appear to be efficient are shown, on investigation, to be inferior to other less popular devices.

Object of the initial investigation was to obtain operating times for standard elements of jigs, tools and fixtures and to tabulate the results so that different designs performing similar functions could be compared. Comparisons were on the basis of time only and ignored cost of manufacture, accuracy and other side issues. It was not considered that the element which was the speediest was necessarily the most suitable for every job although all the items tested are used widely in jig and tool making.

When selecting any particular item for inclusion in the tests it was a condition that the functions of all the items compared should be generally similar. Also, all designs should be practical; therefore, the least efficient, together with the best practice, had to be compared.

Since the tests were concerned with the time taken to operate any tool element and not with the time taken to pick up and transport items, a careful procedure was worked out for the tests A standardized work-place layout was adopted, shown in schematic form in figure 1, and this was suitable for performing all the tests in this initial investigation. In the investigation on the efficiencies of slip drill bushings, for instance, the bushing was lifted from the moving component rest area to the fixed component position, inserted and locked, unlocked and removed and transported back to the rest area again. This work-place layout was suitable for timing the operation of slip drill jig bushings, locating pins and clamping methods, further details of which will be given.

Normal time study stop watch methods were used but owing to the shortness of the time required to move the hand from the moving component rest area to the fixed component position a deviation from direct methods of observing times was adopted. Since a standard work-place layout was adopted, the time taken to move the hand between the various areas would be the same in each test so these movements were calculated, to obtain a constant, from tables of proven synthetic times. Each cycle of operations was performed ten times by the operator and each was timed by the stop watch. The ten times obtained were then added together and an average time for one complete cycle was then obtained. From this average time was deducted the synthetic constant time calculated for transporting the hand between the various areas. The residue of time was thus the observed time taken to, say, insert the bushing and lock it and to unlock and remove it. This was the unknown factor which the investigation was trying to ascertain.

Each operator was shown a normal cycle and then carried out 10 learning cycles so that he was familiar with the

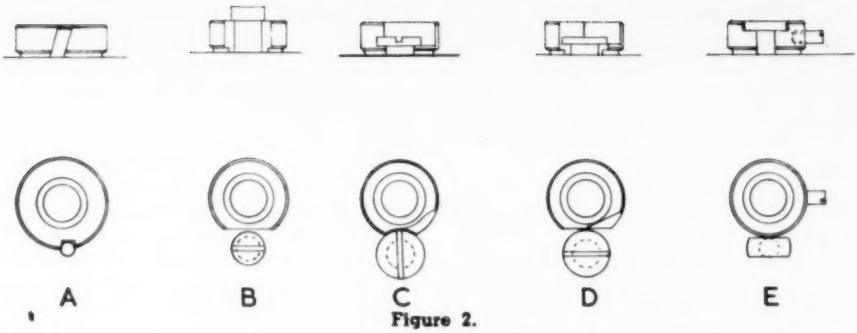


Figure 2.

procedure and had obtained some degree of rhythmic movement before proceeding to perform the 10 timed cycles. No attempt was made to rate operator efficiency.

Slip Drill Bushings

The times taken to insert, lock, unlock and remove the five slip bushings shown in figure 2 formed one part of the investigation. All of the methods of locking the bushings in place are fairly well known, though some are used more widely than others. Bushing **A** comprises a knurled head with a plain slot milled in one side at an angle of 15 degrees to the bush axis for engagement with a locking pin which is inclined at a corresponding angle. The pin is plain and is a driving fit into the hole in the jig body. This form of bushing is a fairly cheap arrangement; the drilling of the angular hole in the jig body is the most difficult feature about it.

Bushing **B** is another low cost arrangement since the locking action is obtained from a plain flat milled along one side of the head. Bushing **C** is the widely used quarter-turn and lock scallop type which is favored by manufacturers of standardized drill jig bushings. Another attempt at economizing the milling processes required on the bushing head is shown at **D.** This bushing is similar to the quarter-turn type in action but does not require rotary milling methods to produce the locking faces. Bushing **E** eliminates milling

Table I—Drill Bushings

Type	Letter on Figure 2	Total Time Average	Total Time Average Less Constant	Percent Efficiency
Angle Pin	A	3.82	1.62	100%
Hook	E	4.05	1.85	87.5%
¼ Turn & Lock, Flat	D	4.23	2.03	80%
Flat & Shoulder Screw	B	4.28	2.08	78%
¼ Turn & Lock, Scallop	C	4.80	2.60	62%

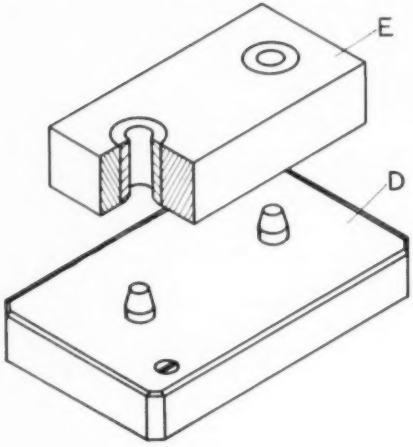
entirely by the insertion of a screwed stop pin into the side of the bushing head; the projecting pin engages with the head of a T-shaped stop which is driven into a plain hole drilled in the jig body. All the bushings were the same size.

The work place layout for timing the insertion of these bushings was as shown in figure 1, and in the fixed component position was secured a ¾ in. thick steel block of square shape In the center of the plate was a hole containing a pressed-in hardened liner bushing into which the hardened slip bushings were to fit. At four positions around the hole were drilled or tapped holes suitable for holding the various anchor pins in correct relation to the slip bushings. Bushings **C** and **D** in figure 2 use the same type of anchoring screw so one position sufficed for both of them. The one fixed plate was thus used for timing the insertion and withdrawal of all five bushings.

Table I summarizes the results obtained in timing the loading and unloading of each slip bushing. The average total time is the one for the complete cycle of transporting the bushing, loading and unloading and transporting it back to the rest area. The average total time, less the constant, is the result of deducting the calculated standard time of 2.20, absorbed in the transporting operations, from the total cycle time; it denotes the actual observed time required for inserting, locking, unlocking and removing the bushing from the plate in the fixed component position.

The shortest time is expressed as 100% efficiency and the other efficiencies are rated as comparisons with it. The figures obtained are fairly self-evident but one cannot refrain from observing that the most popular and widely used slip bushing **C** is the least efficient from the viewpoint of speedy operation. Conversely, one of the cheapest forms **A** is the most efficient. It is only when tests of this nature are made that fallacies long held are revealed.

Figure 3.



Location Pin Head Shapes

With the same work-place layout as shown in figure 1 a series of tests were carried out on the time taken to locate a pair of holes in a movable plate on to a corresponding pair of pins mounted in a fixed plate. Three different location pin head shapes as shown in figure 3 were tried and timed with the simple apparatus shown on the left of the sketch. The apparatus comprises a baseblock **D** screwed to the bench top and carrying a pair of location pins, which may be displaced

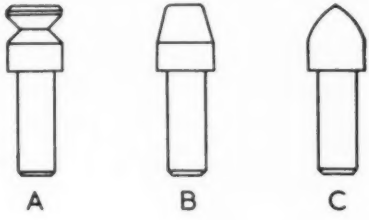


Table II—Location Pin Head Shapes

Type	Letter On Figure 3	Total Time Average	Total Time Average, Less Constant	Percent Efficiency
Domed Head	C	2.83	0.63	100%
Coned Head	B	3.13	0.97	65%
Pilot Head	A	3.21	1.00	63%

by any other pair. The moving component **E** is fitted with hardened bushings for engagement with the pin heads.

Location pin head **A** is one of proprietary make and is characterized by the narrow pilot diameter surmounting the main locating diameter. Location pins **B** and **C** are common and well-known shapes. The clearance between the fitting portions of the pins and the bushing bores in the moving component **E** was 0.002 in. The length of the fitting portion of each pin was 3/16 in. and the nominal diameter was 3/8 in.

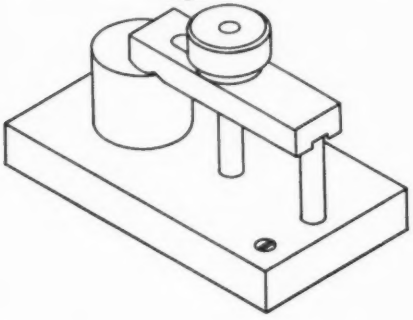
Table II summarizes the times obtained from ten loading and unloading cycles of the plate shown in figure 3, the most efficient pin being rated at 100% with the others compared on a similar basis. Although the results of this test could probably be guessed by an experienced tool engineer it is surprising that the proprietary make of pin **A** comes out with the lowest efficiency. This test indicates a warning to the tool designer not to take anything for granted when trying to estimate the efficiency of one pin against another.

This location pin test was in two parts and the second portion consisted of investigating the effect of clearance between pin and bushing diameters on the speed of location. The domed head pin **C**, being the most efficient, was selected for the clearance test and four sets were used having diametral clearances of 0.0002, 0.0015, 0.001 and 0.005 in. respectively. A clearance of 1½ thousandths came out at 100%; 5 thousandths was 97%; 1 thousandth was 92% and 2/10 thousandths clearance rated 63% efficiency.

Clamping Nuts

The final investigation in the series was to ascertain the times taken to operate various forms of clamping nut using the setup at the left of figure 4.

Figure 4.



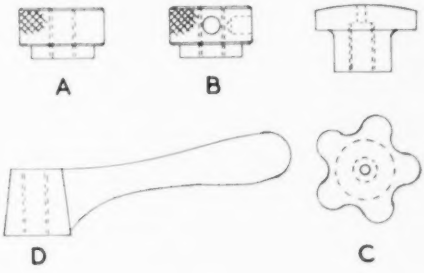


Table III—Clamping Nuts

Type	Letter On Figure 4	Total Time Average	Total Time Average, Less Constant	Percent Efficiency
Handle Nut	D	2.63	0.43	100%
Knurled Nut	A	2.75	0.55	78%
Star Nut	C	2.77	0.57	75%
Wrench & Hex Nut	—	6.31	4.11	10.5%
Bar Nut	B	6.76	4.56	9.5%

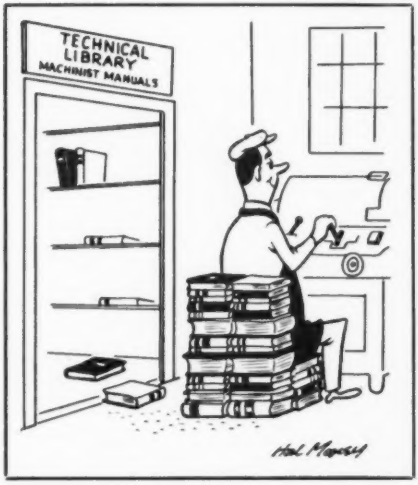
This comprises a base plate fixed to the bench with an upright heel pin to support the back end of the clamp and engaging with a longitudinal slot therein so that the clamp may be guided in its longitudinal movements. The clamp is slotted to accommodate the clamping bolt which carries any one of five clamping nuts at its upper end. The work piece to be gripped by the clamp was a simple cylinder of metal which formed the moving component to be transported to and from the rest area shown in figure 1.

Five forms of clamping nut were selected for testing and four of these are shown in figure 4. The fifth one, not shown, consisted of a common hexagon nut to be tightened by means of a wrench. Nut **A** is a simple cylindrical form knurled on its periphery. Nut **B** is similar but has the addition of four equally spaced horizontal blind holes drilled in it to accommodate a bar for final tightening. Nut **C** is a standard cast iron star type that is used widely as a clamping means. The final form, nut **D**, has an extended handle integral with it and anyone who guesses that this is the quickest to operate will guess correctly.

The results obtained by going through the motions of transporting the component, loading, clamping and then performing the reverse operations with each form of nut ten times in succession are summarized in Table III, below.

The times for the hexagon and bar nuts include picking up and putting down the wrench and the bar and thus are much greater than is the case with the hand operated nuts. One valuable point that these times bring home to the tool designer is that for powerful clamping, the handle nut is the best one to use and should be incorporated whenever space allows.

It will be apparent from the foregoing that any organization can carry out tests of the type described in order to decide for themselves whether or not they are using the most efficient tool elements. The results obtained are likely to prove something of a revelation and will help to explode a lot of fallacious ideas. **The End.**



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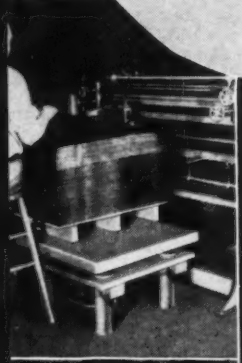

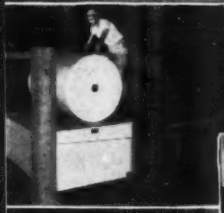

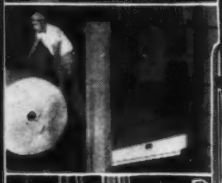

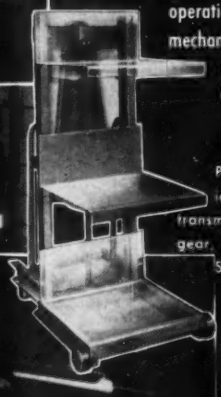

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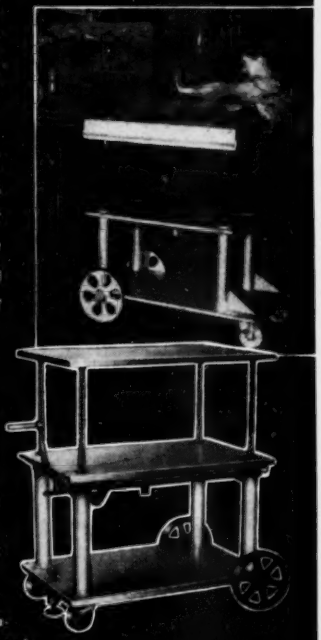

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Machining Nickel Alloy Steels

By **G. P. Witteman**
Asst. Metallurgical Eng.
Bethlehem Steel Co., Inc.

COMBINATIONS OF iron and one or more other elements are in each steel known today; each has specific qualities such as hardness, toughness, tensile strength, machinability, ductility and elasticity. We shall deal principally with machinability here, although the other properties must necessarily be touched upon when speaking of how well or how poorly a metal can be worked. Some of the most common of these elements, aside from the ever-present carbon, are nickel, chromium, vanadium, molybdenum, manganese, silicon and boron.

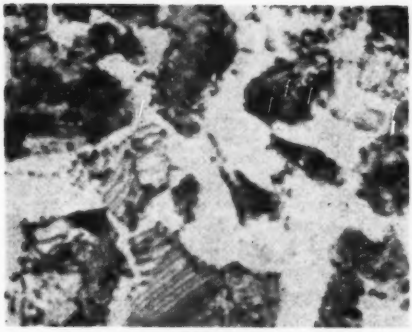
Five conditions are basic factors affecting steel workability: (1) cutting conditions such as speeds and feeds; (2) design, hardness and composition of the cutting tool; (3) capacity and rigidity of the machine; (4) structure of the steel being machined; (5) cutting fluids.

Minute distinctions between the machining characteristics of the numerous nickel steels in various carbon contents in general use will not be made. It will be more practical to present the average. None of the figures given for tool angles, feeds or speeds should be considered final, but only as a guide to the approximate.

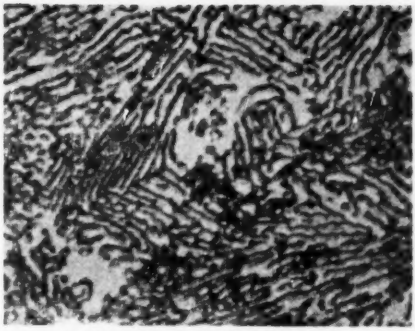
Hardness is most commonly thought of as a basis for computing machinability, and has therefore been selected as the logical means on which to base the tabular matter. Any reason for adjustments must depend then on the character of the microstructure.

There is an optimum microstructure for each type of machining operation, although not necessarily the same for the various operations of a given steel. Sometimes it is expedient to recondition parts in process to produce the varying structures wanted, or a structure might be chosen which provides more of a compromise for all types of uses required.

Since the influence that controls machinability is structure, the composition

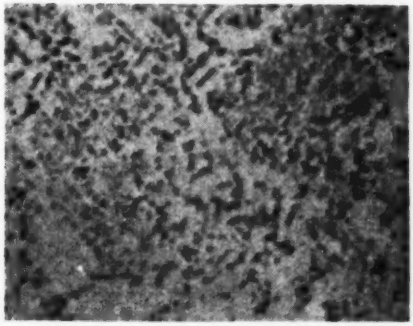


A. Simple anneal—Brinell 163

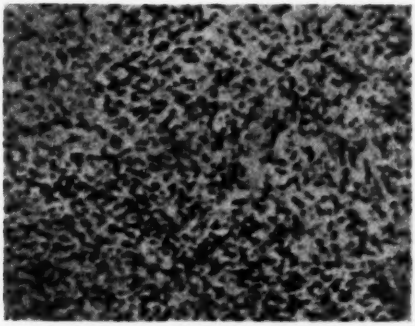


B. Simple anneal—Brinell 223

Structure—Lamellar plus Ferrite

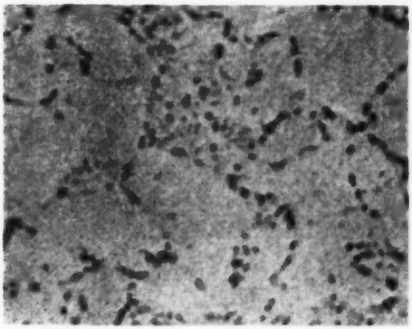


C. Quench & Temper—Brinell 179

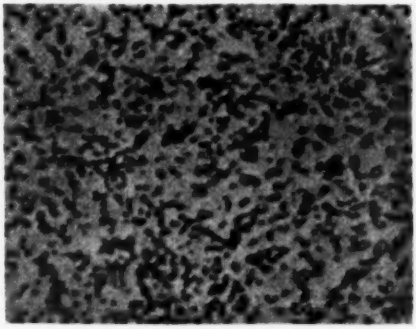


D. Quench & temper—Brinell 248

Structure—Fine Spheroidite



E. Isothermal anneal—Brinell 143



F. Isothermal anneal—Brinell 184

Structure—Coarse Spheroidite

1. Representative examples of the three basic structures in low and medium carbon medium alloyed steels. Etchantpicral plus hydrochloric acid. Magnification X 1000.

2. Cutting speeds in surface feet per minute for rough turning nickel alloy steels.

Group No.	Depth of Cut, inch	Tool Material: High Speed Steel					Cast Non-Ferrous Tool Materials					Sintered Carbides				
Feed, inch per rev. →		*.015*	*.021*	*.030*	*.045*	*.060*	*.015*	*.021*	*.030*	*.045*	*.060*	*.015*	*.021*	*.030*	*.045*	*.060*
Group 1 Brinell up to 163	1/32	215	180	155	130	115	305	270	235	200	180	690	600	520	440	385
	1/16	180	150	130	110	95	250	220	195	175	155	580	500	435	365	325
	1/8	145	125	110	95	80	210	190	170	150	135	490	425	365	315	270
	1/4	125	110	95	80	70	190	170	150	135	120	420	365	310	260	230
	1/2	110	95	80	70	60	170	150	135	120	110	355	305	260	220	190
Group 2 Brinell 163-192	1/32	160	140	120	100	85	230	205	170	150	135	570	490	420	350	305
	1/16	130	110	95	85	75	190	165	145	130	120	470	410	350	295	260
	1/8	110	95	85	75	65	165	145	130	115	105	400	350	295	250	220
	1/4	95	85	75	65	55	145	130	115	105	95	335	290	250	215	185
	1/2	85	75	65	55	50	130	115	105	95	85	285	250	215	180	160
Group 3 Brinell 192-223	1/32	120	105	90	80	70	180	160	140	120	110	470	400	350	290	260
	1/16	100	90	80	70	60	150	135	120	105	95	395	340	290	245	220
	1/8	90	80	70	60	50	125	115	105	95	85	330	285	245	205	180
	1/4	80	70	60	50	40	115	105	95	85	75	280	240	205	175	155
	1/2	70	60	50	40	35	105	95	85	75	70	235	200	170	145	130
Group 4 Brinell 223-255	1/32	100	85	75	65	55	145	130	115	100	90	400	340	290	245	210
	1/16	85	75	65	55	45	120	105	95	85	75	335	290	245	210	180
	1/8	75	65	55	45	40	100	90	80	75	65	280	245	210	175	155
	1/4	65	55	45	40	35	90	80	70	65	60	240	205	175	150	130
	1/2	55	45	40	35	30	80	70	65	60	55	200	175	150	125	110
Group 5 Brinell 255-285	1/32	90	75	65	55	50	125	110	95	85	75	350	305	260	215	190
	1/16	75	65	55	45	40	105	95	85	75	65	295	255	215	180	160
	1/8	60	55	45	40	35	95	85	75	65	55	250	215	180	155	135
	1/4	55	45	40	35	30	85	75	65	55	50	210	180	155	130	115
	1/2	50	40	35	30	25	75	65	60	50	45	180	155	130	110	100
Group 6 Brinell 285-321	1/32	80	70	60	50	45	110	95	85	75	70	300	260	220	185	165
	1/16	65	55	50	40	35	95	85	75	65	60	255	220	185	160	135
	1/8	55	45	40	35	30	85	75	65	60	50	215	185	160	135	115
	1/4	45	40	35	30	25	75	65	60	50	45	180	155	135	110	100
	1/2	40	35	30	25	20	65	60	50	45	40	150	130	110	95	85
Group 7 Brinell 321-352	1/32	75	65	55	45	40	100	90	80	70	65	265	230	195	165	145
	1/16	60	50	45	40	35	85	75	70	60	55	225	195	165	140	120
	1/8	50	45	40	35	30	75	65	60	55	50	190	160	140	120	100
	1/4	45	40	35	30	25	65	60	55	50	45	160	140	120	100	90
	1/2	40	35	30	25	20	60	55	50	45	40	135	115	100	85	75
Group 8 Brinell 352-388	1/32	70	60	50	40	35	90	80	70	60	55	235	200	175	145	130
	1/16	55	45	40	35	30	75	70	60	55	50	200	170	145	125	110
	1/8	45	40	35	30	25	65	60	55	50	45	165	145	125	105	90
	1/4	40	35	30	25	20	60	55	50	45	40	140	120	105	90	80
	1/2	35	30	25	20	20	55	50	45	40	35	120	105	90	75	65
Group 9 Brinell 388-415	1/32	65	55	45	35	30	85	75	65	55	50	215	185	160	135	120
	1/16	50	40	35	30	25	70	65	55	50	45	180	160	135	115	100
	1/8	40	35	30	25	20	60	55	50	45	40	155	135	115	100	85
	1/4	35	30	25	20	20	55	50	45	40	40	130	115	100	80	75
	1/2	35	30	25	20	15	50	45	40	40	35	110	95	80	70	60

of steel is important only in the way it reaches that structure. It has been shown that the Taylor speed of steels of the same tensile strength will be the same if their yield-tensile ratios are the same, no matter what composition. Therefore, microstructure, and not chemical composition, determines mainly the way alloy steels can be handled. There are three main types of structures, figure 1: (1) a lamellar pearlitic structure (the normal structure of annealed constructional steels); (2) a coarse spheroidized structure (resulting usually from spheroidization of the lamellar structure); and (3) a fine spheroidized structure characterized by a finely divided, almost emulsified, distribution of the carbides (resulting from a quenching and tempering operation and commonly referred to as "sorbitic"). These structures, of course, differ greatly within each type classification depending on the amount of carbide present and the size and distribution of the carbide particles or lamellar plates. Low carbon steels, normalized, or annealed by simple furnace cooling, will, for example, usually develop structures combining lamellar pearlite with relatively large, or blocky ferritic areas. This is illustrated in figure 1 which shows the contrast between the three types of structure as developed in a medium (0.45%) carbon alloy steel and the same steel with low (0.15%) carbon.

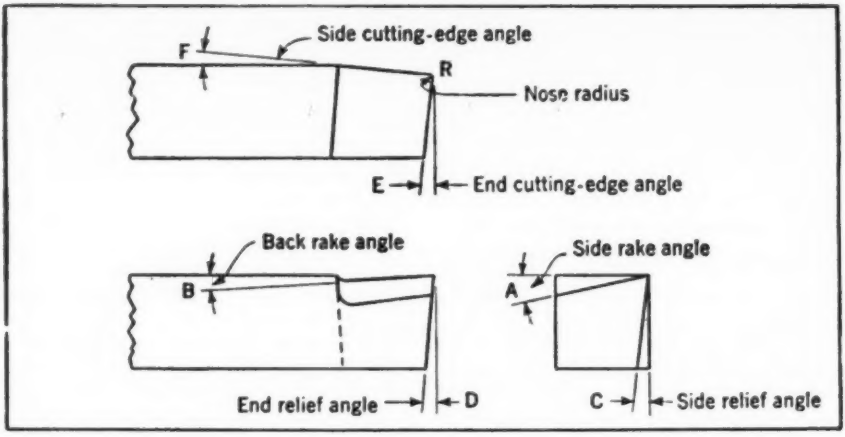
For this article, nine hardness ranges have been taken as representative, figure 2. Group 1 is up to 163 Brinell, 2 is 163 to 192, 3 is 192 to 223, 4 is 223 to 255, 5 is 255 to 285, 6 is 285 to 321, 7 is 321 to 352, 8 is 352 to 388, and 9 is 388 to 415. Most annealed, rolled or normalized nickel alloy steels will fall in the first four groups.

Machinability may be helped by mechanical operations which serve to decrease ductility without increasing strength as when temperature high enough to coarsen the grain size are used, around 1750° F. or above. Chips break away from the cutting tool with less tendency for the cutting edge to develop a 'built-up" layer. Cold drawing accomplishes much the same results. Hot rolled steel bars, possessing tensile strength of 100,000 lb. p.s.i. and an elongation of 22.5% may show after cold drawing an elongation of only 11.5% accompanied by a strength increase to only 125,000 lb. p.s.i. A subcritical tempering heat treatment after cold drawing will often bring the mechanical properties into better balance and provide a further improvement in machinability through reduction, within limits, of the hardness. Cold drawn steels possess the further advantages of dimensional accuracy and freedom from rolling mill scale, factors of greater importance when operations are carried out on automatic screw and chucking machines.

Another way to improve machinability by hastening "chip breakage" is the deliberate addition during manufacture of the steel of elements, such as sulfur, which will result in a distribution of insoluable inclusions throughout the mass. These mechanically interrupt chip formation with consequent improvement in machinability. Some frown on this practice, however.

Figures for high speed steel tools showing approximate cutting speeds for rough turning nickel alloy steels with single point lathe tools, figure 2, are based on data in the American Society of Mechanical Engineers' manual, adjusted to take account of the use of cutting fluids and improvements made in alloys recently. These represent good starting speeds for normal every-day practice. For light finishing cuts with fine feeds, the maximum speeds given for each group may be increased from 50% to 100% or more.

Suitable tool angles and nose radii for single point lathe tools operating on continuous cuts are indicated in figure 2. For interrupted cuts, and with planer



Designation	Mark	Angles, degrees					
		High Speed Steel		Cast Non-Ferrous Tool Materials		Sintered Carbides	
		Range	Ave.	Range	Ave.	Range	Ave.
Side rake angle	A	5 to 15	10	5 to 15	12	0 to 15	6*
Back rake angle	B	5 to 10	8	0 to 7	0	0 to 10	0
Side relief angle	C	6 to 10	8	7 to 10	7	4 to 12	7
End relief angle	D	6 to 10	8	7 to 10	7	4 to 12	7
End cutting-edge angle	E	6 to 15	10	6 to 15	10	8 to 15	10
Side cutting-edge angle	F	0 to 30	15	0 to 45	15	0 to 20	15
Nose radius	R	10% of cut depth		1/32"		1/32"	

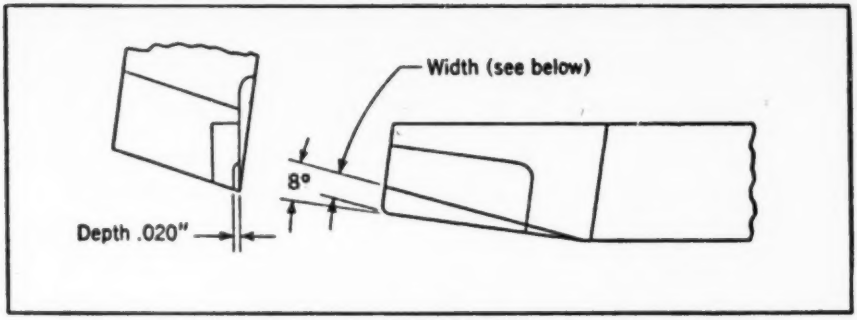
* Average for depths of cut less than 1/4" is 8°; for heavier cuts, 4°.

3. Typical tool angles for continuous cutting single point lathe tools.

or shaper tools, it is desirable to use a negative back rake of from 2° to 8°, average 5°. When a negative back rake is used the side rake angle should be positive and from 2° to 5° greater than the negative back rake angle.

When using sintered carbide tools at high cutting speeds, chip curlers or breakers should be ground on the tools, (see page 262, March, 1953, MACHINE and TOOL BLUE BOOK—"Grinding Chip Breakers") if the cut is continuous, in order to break up the chips or coil them into convenient form for removal, figure 4. A chip breaker depth of .020" is satisfactory in most cases. The optimum width of the breaker will vary from 1/16" to 1/4" or more, increasing with the depth of cut and with the coarseness of the feed.

Sometimes heat treated nickel alloy steels machined with sintered carbide tools at high speeds will, in many cases, show such a smooth, accurate finish that no subsequent grinding is necessary. In other cases grinding allowances have been reduced, saving wheel wear. Constructional steels of nickel alloy are



Chip Breaker Width in Inches

Depth of Cut, in.	Feed, inches per revolution	
	.015	.030
1/16	5/64	1/8
1/16	1/8	3/16
1/8	1/8	3/16
1/8	1/8	3/16
1/4	1/8	3/16
1/2	5/32	7/32

4. Sintered carbide-tipped turning tool with chip breaker.

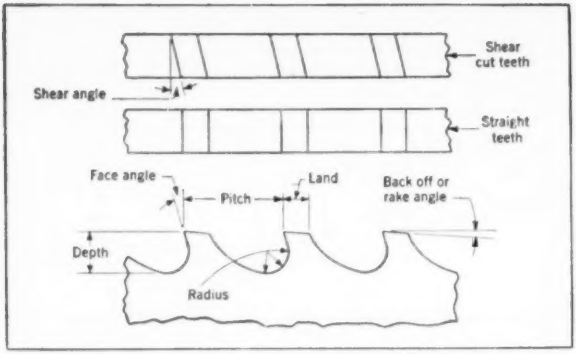
prepared in the form of bars for use in turret lathes and single and multiple spindle automatic machines. For this work, allowable cutting speeds are high because lighter cuts are generally used.

Broaches used for carbon steels will cut nickel alloy steel if the latter is properly conditioned to produce correct structure. Of course, the speed will vary with the hardness of the work, but generally an 18 to 24 f.p.m. will be found satisfactory.

Design features of a broach, figure 5, are ordinarily determined by the broach manufacturer, based on the operation to be performed and the material to be cut. The longer the cut and the greater the chip thickness the greater must be the pitch in order to provide adequate chip space. A formula sometimes used for determining pitch provides that the pitch shall be 35% of the square root of the length of cut. Typical dimensions of round and spline broaches for cutting steel are shown in figure 6.

Varying between 8° and 20°, the face angle decreases as the hardness of the steel being cut increases. The back-off or rake angle will normally vary between ½° to 2° for internal broaches and up to 3½° for surface broaches. It is not unusual to vary this clearance angle from 2° at the small end to ½° at the finish end. The entire land is usually relieved on the cutting teeth, but part of the land is straight—parallel to the broach axis—on finishing teeth. Often this straight portion is graduated in length from the first finishing tooth to the last in order to prolong the life of the broach.

When cutting nickel alloy steels, the step or cut per tooth may be of the order of .004" for keyway and surface broaches. The principle of shear cutting



5. Broach nomenclature.

may often be used on surface broaches. Angles vary from 5° to 20°.

Drilling feeds and speeds for drilling nickel alloy steels with high speed steel drills are shown in figure 7. Rate of penetration and peripheral speed both decrease with increasing hardness of the work material, but remain fairly constant for a given hardness level regardless of the drill size. Feed should become coarser and speed of rotation should decrease with increasing drill size. As shown in figure 8, the harder the steel the blunter the point of the drill should be. A lip clearance angle of about 10° is satisfactory for hardnesses up to Group 3 (up to 222 Brinell). For steels having higher hardnesses, better results are obtained with lesser lip clearance angles, as low as 5° in some cases.

Drills should have a heavy web structure, thinned at the point, and be designed with a slower helix angle, when Brinell hardness runs 400 and higher. For steels of over 350 Brinell hardness, cobalt type high speed steel drills are preferred. If the depth of the hole is equal to four or five times the diameter of the drill or more, oil-hole drills should be taken into consideration. This applies to drills ⅜" and larger.

When tapping nickel alloy steels, taps of high speed steel, ground thread type, are usually used. The limit of hardness of the material to be tapped is set at 350 Brinell (Group 7), figure 9. In tapping

6. Typical dimensions in inches of round and spline broaches.

Length of Cut	Pitch	Land	Depth	Radius
3/16	1/8	3/64	3/64	1/32
1/4	3/16	1/16	1/16	1/32
1/2	1/4	1/16	3/32	1/16
1	11/32	3/32	1/8	5/64
2	1/2	1/8	3/16	1/8
3	5/8	5/32	15/64	5/32
4	11/16	5/32	9/32	3/16
6	7/8	3/16	11/32	7/32
8	1	7/32	3/8	1/4
12	1 1/4	9/32	13/32	9/64

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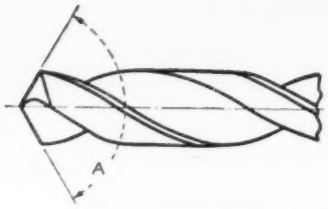
Group No.	Brinell Hardness	Approximate Inches Drilled per minute	Approximate Peripheral Speed, feet per minute	R.P.M. (upper figures) and Feed, in. per revolution, for given drill size				
				1/8"	1/4"	1/2"	3/4"	1"
1	up to 163	4 1/2	75	2300 .0020	1150 .0040	575 .0080	385 .0120	285 .0160
2	163–192	4	70	2140 .0020	1070 .0040	535 .0075	355 .0110	265 .0150
3	192–223	3	60	1830 .0015	915 .0035	460 .0065	305 .0100	230 .0130
4	223–255	2 1/4	50	1530 .0015	765 .0030	380 .0060	255 .0090	190 .0120
5	255–285	1 3/4	45	1370 .0015	685 .0025	340 .0050	230 .0075	170 .0010
6	285–321	1 1/4	40	1220 .0010	610 .0020	305 .0040	200 .0060	150 .0085
7	321–352	1	30	920 .0010	460 .0020	230 .0040	150 .0060	115 .0080
8	352–388	3/4	25	760 .0010	380 .0020	190 .0040	125 .0060	95 .0080
9	388–415	1/2	15	460 .0010	230 .0020	115 .0040	75 .0060	55 .0080

7. Approximate feeds and speeds for drilling nickel alloy steels when high speed drills are used with a cutting fluid.

the harder steels such as Groups 6 and 7, it is customary to perform the operation in two steps, roughing and finishing.

Threading with chasers is also done with high speed steel. For handling the grades of steel under discussion, the chamfer or lead angle should not be more than 20°. The feed of a threading tool is fixed by its pitch; thus one with a pitch of 16 threads per inch must feed .0625" per revolution. A long chamfer on chasers is the only way to distribute the cut unless the thread is recut. Figure 10 shows the various types of chasers.

The chaser's cutting edge should be smooth and ground with a hook. For reasons of economy the chaser should be reground frequently to remove false edges and to maintain proper clearances and keen edges. Lower tool cost and better work is the result of frequent resharpening. It is also necessary that proper alignment be maintained between the die and work. The die head should be given a sufficient start in order to prevent cramping,



8. Variation of the point angle "A" with hardness in drilling nickel alloy steels.

Group No.	*Brinell Hardness*	*Point Angle, degrees*
1 to 3	Up to 223	118
4 to 6	223-321	125
7 to 9	321 and over	150

tearing and taper threads.

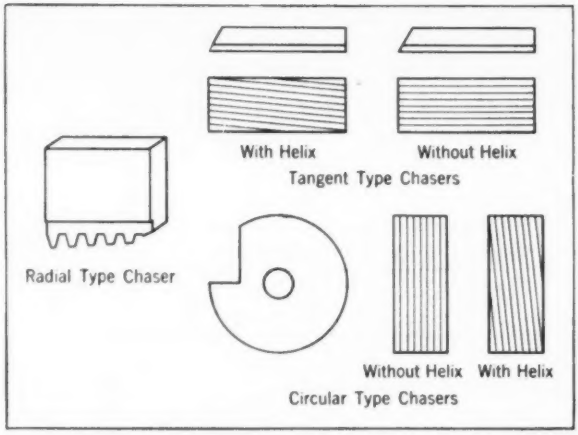
Figure 11 shows the threading speeds that have been found to be satisfactory for threading Groups 1, 2 and 3. Speeds should be decreased 20% to 30% when threading steels in groups 4 and 5. For the higher levels of hardness it is often best to form threads by grinding.

Milling these alloy steels, especially in the harder states, is more efficiently done with sintered carbide tipped tools. As figure 12 indicates, much faster cutting speeds are possible with such tools than with the high speed steel milling cutters. Heavier speeds are also practicable, as shown in figure 13. The surfaces produced are often accurate and smooth enough to dispense with subsequent grinding. When operating milling cutters at high speeds the use of a flywheel is recommended to reduce milling machine maintenance and prolong cutter life.

The tooth angle of milling cutters of any material should be as large as is practicable in order to improve tooth strength and heat dissipation, figure 14. The tooth should be provided with a land varying in width from 1/64" for small diameter cutters to 1/16" for larger sizes. The clearance angle behind the land should be as small as possible for the same reasons that the tooth angle should be large. In cutters of ⅛" to 3" dia., this angle usually varies from 13° to 5°. When resharpening these tools a secondary clearance is often ground in order to maintain the original width of land. This secondary clearance angle is usually made 3° larger than the primary clearance angle. Relief angles should be 3° to 5°.

9. Tapping nickel alloy steels

Group No.	Brinell Hardness	Cutting Face of Tap Provided With	Peripheral Speed, ft. per min.
1 and 2	Up to 192	10–15° rake or hook	40–50
3 to 5	192–285	8–10° rake or hook	25–40
6 and 7	285–352	Zero to 2° positive rake with a straight face. Also desirable to have small amount of radial relief	20–35



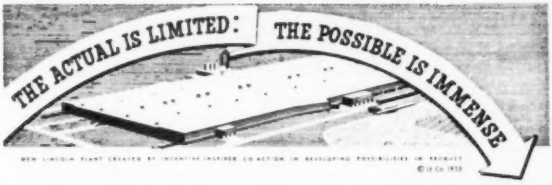
10. Chasers for threading nickel alloy steels.

The corner or nose where the two cutting edges meet should be chamfered or rounded in face milling cutters. A chamfer or bevel is preferred over a radius except when the character of the operation requires milling a given radius, in which event round nose cutters must be used. Chamfer angles of 15°, 30° and 45° are in general use. The latter is probably the most common, but smaller angles are being recommended because less metal need be ground off in producing the chamfer. This is because the preferred length of the chamfer for a given depth of cut is a function of the chamfer angle. To obtain chamfer length the depth of cut should be multiplied by 1.10, 1.25 and 1.50 respectively, for chamfer angles of 15°, 30° and 45°.

Positive rake angles of about 10° are generally used when high speed milling cutters are used. In standard form relieved cutters, angles of 0° and 5° are also used. In sintered carbide tipped

10. Suggested speeds for threading nickel alloy steels

Thread Diameter, in.	Coarse Thread (U.S.S.)		Fine Thread (S.A.E.)	
	Surface Speed, ft. per min.	Speed, RPM	Surface Speed, ft. per min.	Speed, RPM
1/4	35	535	40	611
3/8	30	306	35	357
1/2	25	191	35	286
5/8	25	153	35	214
3/4	20	102	30	153
1	20	76	30	115
1 1/4	18	55	25	76
1 1/2	18	46	25	64
2	15	29	20	38
2 1/2	15	23	15	23
3	10	13	12	15



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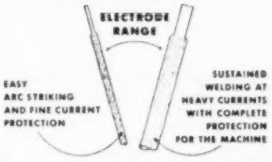
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Group No.	Brinell Hardness	Cutter Material	
		High Speed Steel	Sintered Carbides
1	Up to 163	133	615
2	163–192	103	543
3	192–223	81	484
4	223–255	67	438
5	255–285	55	398
6	285–321	46	367
7	321–352	39	340
8	352–388	34	318
9	388–415	30	300

12. Approximate cutting speeds in feet per minute for milling nickel steel

cutters, zero and negative rake angles are favored in order to increase the tooth angle and thus provide more material behind the tooth face, and also greater strength. Negative angles of 10° are usually satisfactory for nickel alloy steels. In milling cutters, such as face mills, which possess axial as well as radial rake, the two angles are usually, but not always, made equal.

Saw manufacturers say that there are so many variables that correlations of speeds, hardness, pressures, tooth spacing, etc., are very impractical. However, for general applications, certain rules apply.

For conventional sawing, a hard edge, flexible back band saw with from 10 to 24 teeth per inch, raker set, or 32 teeth per inch with a group or wave set, as shown in figure 15, are the most satisfactory types to use for the sawing of nickel alloy steels. The number of teeth per inch is dependent on the thickness of the material to be sawed; the lighter the gage of metal, the greater the number of teeth. As the hardness of the stock increases, finer

13. Approximate feeds in inches per tooth for milling nickel steels

Group No.	Brinell Hardness	Cutter Material	Type of Milling Cutter				
			Face Mills	Helical Mills	Slotting & Side Mills	End Mills	Form Cutters
1 and 2	Up to 192	High Speed Steel	.010	.008	.006	.005	.003
		Sintered Carbides	.012	....	.008	.007	.004
3	192-223	High Speed Steel	.008	.007	.005	.004	.003
		Sintered Carbides	.012	....	.008	.007	.004
4 and 5	223-285	High Speed Steel	.006	.005	.004	.003	.002
		Sintered Carbides	.011	....	.007	.006	.004
6 to 9	285-415	High Speed Steel	.004	.003	.003	.002	.002
		Sintered Carbides	.010	....	.006	.005	.003

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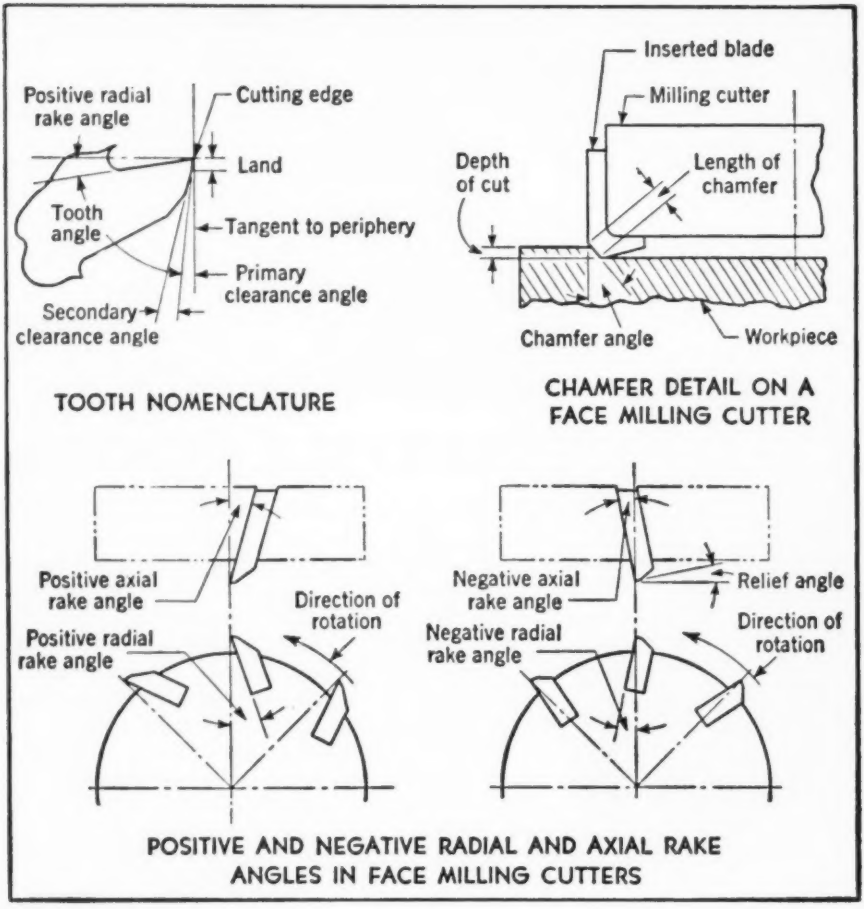

14. Milling cutter nomenclature

tooth spacing and lower speeds should be used. When possible, a saw tooth should be chosen with teeth numerous enough to keep at least two in the cut. A tooth-spacing of less than ten to the inch isn't recommended. The width of the blade is determined by the particular machine on which the saw will operate, by the rate of feed, and by the curvature to be cut. The greater the feed, the wider the saw must be to withstand the pressure. The smaller the radius to be cut, the narrower must be the saw. The speed of the blade ranges from 90 to 125 f.p.m. for the material over ¼" and from 125 to 225 f.p.m. for the lighter gages. Although a coolant is rarely used it will lengthen the life of the saw.

In friction sawing it is possible to friction-cut nickel alloy steels of the lighter gages with a band saw running

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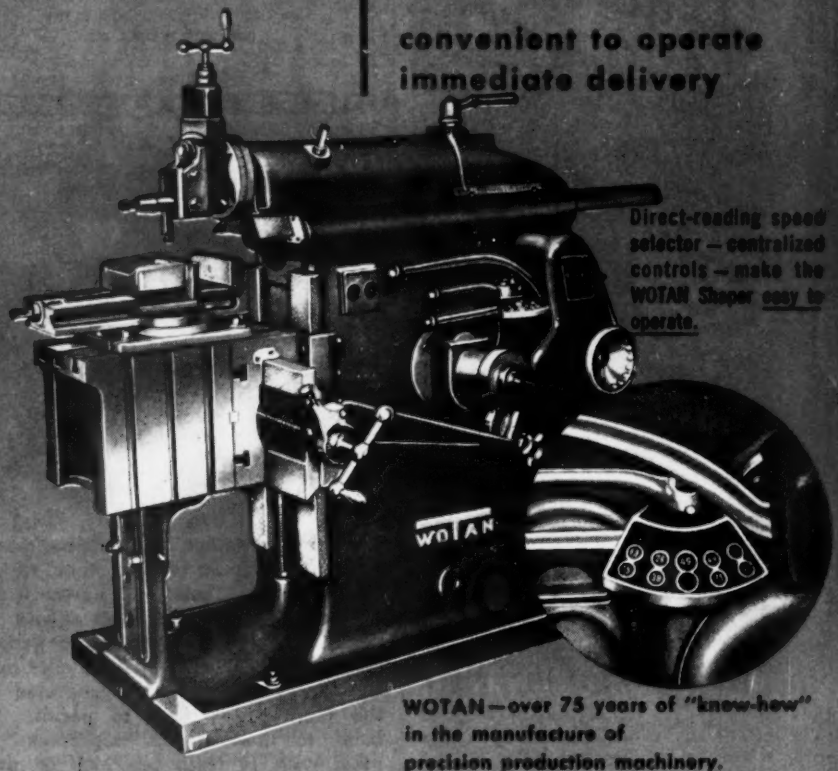

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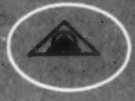

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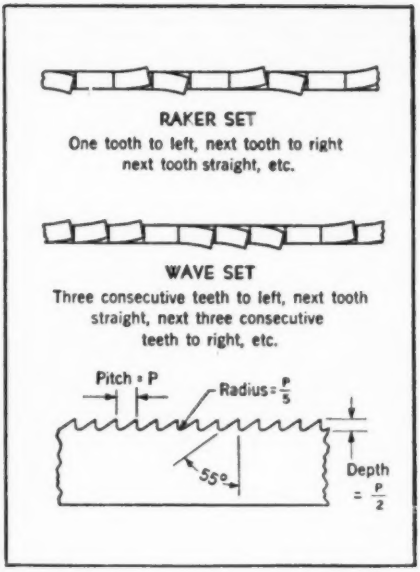
RAKER SET
One tooth to left, next tooth to right next tooth straight, etc.
WAVE SET
Three consecutive teeth to left, next tooth straight, next three consecutive teeth to right, etc.
Pitch = P
Radius = P/5
55°
Depth = P/2

15. Raker-set and wave-set band saws

up to 12,000 f.p.m. or more. This can be done with either a flexible back hard edge type or an all hard or spring tempered type band, the latter being the most suitable. Friction sawing of steels over ½" in thickness is not generally recommended because thicker materials dissipate the heat generated by the band too rapidly to permit the band to make much impression. A band with 14 teeth per inch is most satisfactory in this type of sawing.

With circular saws, the speeds will vary from 40 to 60 f.p.m. rim speed, depending on the size and shape of the material to be cut. The lighter the gage of the material, the faster the speed. Teeth angles for these circular saws will vary from 5° to 15° hook or rake angle, and from 5° to 12° top clearance angle. Suitable feeds will vary from ¼" to 2½" per minute, depending on the size of the stock being cut. The chip load or feed should be about .004" per

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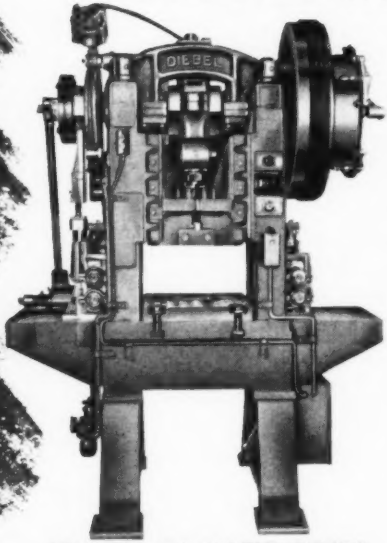

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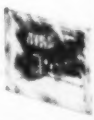

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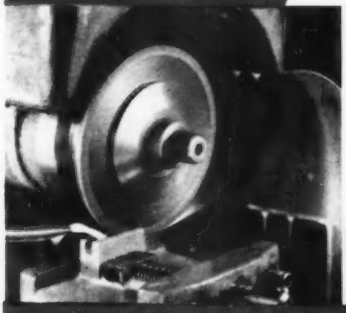

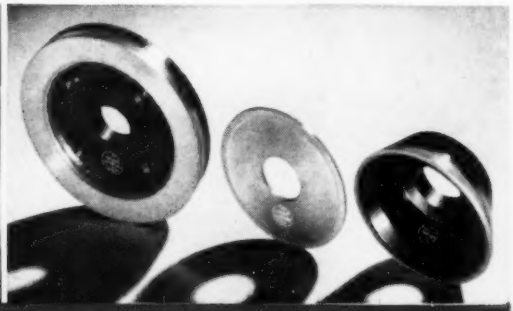

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Operation	Abrasive Grit Size, Range	Grade Range	Bond	Wheel Speed, surface ft. per min.
Groups 1–4 (Brinell up to 255)				
Centerless	36–60	Med.	Vitrified	5500–6500
Cylindrical	36–60	Med.	Vitrified	5500–6500
Cutting-off	24–46	Hard or med.	Resinoid	9500–16000
Internal	46–60	Med. or soft	Vitrified	5500–6500
Surface:				
Straight Wheel	24–54	Med. or soft	Vitrified	4500–5000
Cylindrical or Segmental Wheel	16–46	Soft	Vitrified	4500–5000
Groups 5–9 (Brinell 255–415)				
Centerless	46–80	Med. or soft	Vitrified	5500–6500
Cylindrical	46–80	Med. or soft	Vitrified	5500–6500
Cutting-off	36–54	Hard or med	Resinoid	9500–16000
Internal	46–80	Med. or soft	Vitrified	5500–6500
Surface:				
Straight Wheel	24–60	Med. or soft	Vitrified	4500–5000
Cylindrical or Segmental Wheel	16–46	Soft	Vitrified	4500–5000
Case-hardened Steels				
Centerless	46–80	Med.	Vitrified	5500–6500
Cylindrical	46–80	Med.	Vitrified	5500–6500
Cutting-off	36–54	Hard or med.	Resinoid	9500–16000
Internal	46–60	Med. or soft	Vitrified	5500–6500
Surface:				
Straight Wheel	24–60	Med. or soft	Vitrified	4500–5000
Cylindrical or Segmental Wheel	16–46	Soft	Vitrified	4500–5000

16. Aluminum oxide type wheels for grinding nickel alloy steels

tooth. These saws are made in the following types: (a) the solid, or milling saw, (b) the inserted tooth saw in which each tooth is locked with a wedge, (c) the inserted tooth saw in which a group of teeth is locked with one wedge, and (d) the inserted section and segmental-type saw, or inserted tooth saw of the continuous rim type.

The solid type is recommended in the smaller diameters. The inserted tooth type with the individual wedge is recommended when the cross-sectional area of the stock being cut has a section not less than the equivalent area of a 3½" round and where smooth cutting is not important. A group of teeth, locked with one wedge, is recommended when cutting stock with a relatively small cross-sectional area, such

Relative Severity of Operation	Type of Operation	Group No. 1. Brinell Up to 163	2. Brinell 163-192	3. Brinell 192-223	4 to 9. Brinell over 223
1. (Greatest)	Broaching—Internal	Em Sulf	*Sulf* Em	*Sulf* Em	*Sulf* Em
2.	Broaching—Surface	Em Sulf	*Em* Sulf	*Sulf* Em	*Sulf* Em
3.	Tapping—Plain	Sulf	Sulf	Sulf	Sulf
2.	Threading—Pipe	Sulf	*Sulf* ML	Sulf	Sulf
3.	Threading—Plain	Sulf	Sulf	Sulf	Sulf
4.	Gear Shaving	Sulf L	Sulf L	Sulf L	Sulf L
4.	Reaming—Plain	ML Sulf	ML Sulf	ML Sulf	ML Sulf
4.	Gear Cutting	Sulf ML	Sulf	Sulf	Sulf ML
5.	Drilling—Deep	*Em* ML	Sulf *Em*	Sulf	Sulf
6.	Milling—Plain	Em ML Sulf	Em	Em	Sulf
6.	Milling—Multiple Cutter	ML	Sulf	Sulf	*Sulf* ML
7.	Boring—Multiple Head	*Sulf* Em	*Sulf* Em	*Sulf* Em	Sulf Em
7.	Multiple Spindle Automatic Screw Machines and Turret Lathes — Drilling, Forming, Turning, Reaming, Cutting Off, Tapping, Threading	Sulf Em ML	Sulf Em ML	Sulf Em ML	Sulf Em ML
8.	High Speed, Light Feed Automatic Screw Machines —Drilling, Forming, Tapping, Threading, Turning, Reaming, Box Milling, Cutting Off	Sulf Em ML	Sulf Em ML	Sulf Em ML	Sulf Em ML
9.	Drilling	Em	Em	Em	Em Sulf
9.	Planing, Shaping	*Em* Sulf ML	*Em* Sulf ML	Sulf *Em*	*Em* Sulf
9.	Turning—Single Point Tool, Form Tools	Em Sulf ML	Em Sulf ML	Em Sulf ML	Em Sulf ML
10. (Least)	Sawing—Circular, Hack	Sulf ML Em	Sulf Em ML	Sulf Em ML	Sulf Em ML
	Grinding—(a) Plain	Em	Em	Em	Em
	(b) Form (Thread, etc.)	Sulf	Sulf	Sulf	Sulf

SYMBOLS FOR CUTTING FLUIDS

L—Lard Oil
ML—Mineral—Lard Oils
Sulf—Sulphurized Oils*
Em—Soluble or Emulsifiable Oils and Compounds

* Oils containing both sulphur and chlorine when carefully manufactured and sponsored may be used where sulphurized oils are indicated.

This table is based on recommendations made to the Society of Automotive Engineers by the Independent Research Committee on Cutting Fluids.

17. Suggested cutting fluids for various machining operations of nickel alloy steels based upon normal operating speeds, tool life and finish.

as structural shapes, "H" columns and tube stock, having walls ¼" thick or thicker; or small rounds, small squares and flats having a cross-sectional area less than 10 sq. in. The inserted section and segmental type blades are used when a smooth cut is desired, as the tooth-spacing is less than with the saw having each tooth held by a wedge. A coolant of soluble oil is generally used on this kind of cutting. Circular saws are operated on milling machines and metal cut-off machines.

Power hacksaw speeds ranging from 40 to 120 strokes per minute are being used with feeds from .002" to .020" per stroke. Of the four tooth spacings available, the 10 and 14 teeth per inch blades are generally used to cut steels of small cross section and hardness above ap-

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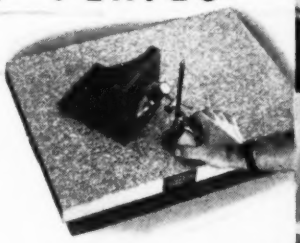

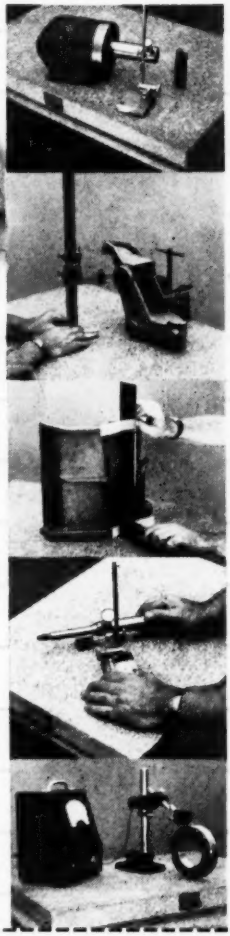

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Carbon Range	Type of Conditioning Heat Treatment	Type Structure	Relative Machinability in			
			Turning	Forming	Drilling	Broaching and Gear Generation
Low (.08-0.30%)	Normalize and/or Anneal	Lamellar with Blocky Ferrite	Good	Good	Good	Good
	Quench and Temper*	Fine Spheroidite	Good	Good	Good	Good
Medium (0.30-0.50%)	Anneal	Coarse Spheroidite	Good	Poor	Fair	Poor
	Anneal	Lamellar	Fair	Good	Good	Good
	Quench and Temper	Fine Spheroidite	Fair	Fair	Fair	Fair
High (0.50-0.70%)	Anneal	Coarse Spheroidite	Good	Good	Good	Fair
	Anneal	Lamellar	Fair	Poor	Poor	Fair
	Quench and Temper	Fine Spheroidite	Good	Fair	Good	Good

* This treatment is rarely applied to low carbon bar stock, but is frequently used to condition forgings.

18. Relative machinability of steel as related to structure and carbon content.

proximately 321 Brinell. For larger sections the six tooth per inch blade is usually preferred for the harder steels and the four tooth per inch blade for the softer grades.

Grinding wheel materials for nickel alloy steels are given in figure 16, subject to change depending on special job requirements; fine finishes call for different recommendations from separate manufacturers ofttimes. For mirror finishes, for example, one wheel manufacturer recommends a soft-grade silicon carbide shellac-bonded wheel using 320 grit, or a very soft resinoid-bonded wheel using 500 grit. Other factors influence wheel selection but in general hard wheels should be used for grinding soft steels and soft wheels for hard materials. If stock removal is to be heavy, the wheel should have a coarse grained, open structure; if light, a fine grained, dense structure. Wide areas of contact require softer wheels than narrow. Heavy, rigid grinding machines can use softer grade wheels than light machines. Harder and denser wheels must be used if the machine is worn and loose.

Ordinarily, fast work speed tends to wear the wheel faster than slow work speed. Slower speeds give softer wheel

19. Representative conditioning treatments for low and medium carbon alloy steels.

Mark in Fig. 1	Type of Treatment	Details of Treatment				Final Structure
		Operation	Time, hours	Temp., °F.		
				0.15% carbon	0.45% carbon	
A and B	Simple Anneal	Furnace cool after	1	1600	1500	Lamellar plus Ferrite
C and D	Quench and Temper	Oil quench after	1	1600	1500	Fine Spheroidite (Sorbite)
		Temper	2	1250	1250	
E and F	Isothermal Anneal	Normalize	1	1575	1450	Coarse Spheroidite
		Austenitize	1	1500	1350	
		Transform	10	1225	1225	

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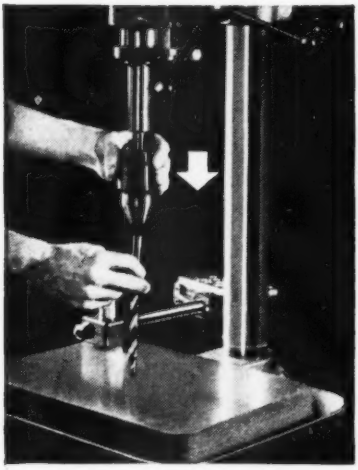

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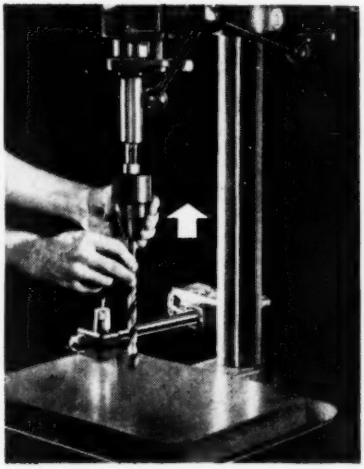

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TO CLOSE – Insert new tool – push up tapered part – tool is locked in place.

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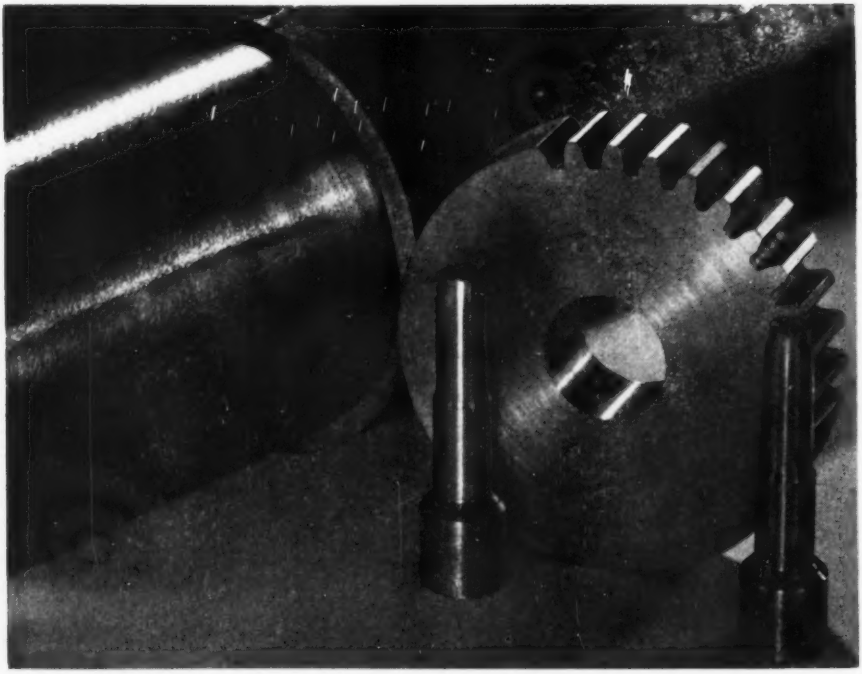


20. Gear blank and test bars machined from nickel-chromium-molybdenum steel at 477 Brinell hardness. Composition: carbon, 0.41%; manganese, 0.60%; nickel, 2.24%; chromium, 1.02%; molybdenum, 0.46%. Properties: tensile strength, p.s.i., 239,000; yield point, p.s.i., 203,000; elongation in 2", %, 11; reduction of area, %, 42; Brinell hardness, 477.

action. The higher the work speed in relation to the wheel speed, the more work the wheel is required to do in a given amount of time; hence, the wheel has a tendency to wear at a faster rate.

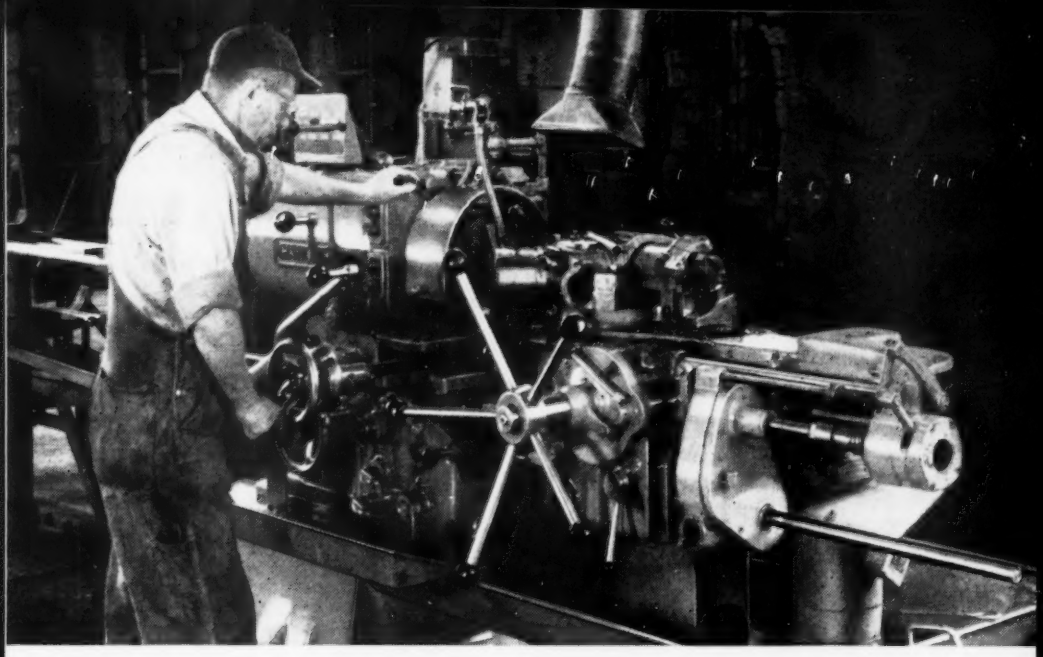
Figure 17 gives a list of suggested cutting fluids for use in machining the nickel alloy steels. The table is based on a report made to the Society of Automotive Engineers by the Independent Research Committee on cutting fluids.

Figures 18 and 19 show relative machinability of steel as related to structure and carbon content, and representative conditioning treatments for low and medium carbon alloy steels, respectively.

In figure 20 is seen a typical gear blank and test bars machined from nickel-chromium-molybdenum steel at 477 Brinell hardness. Composition is shown in the caption.

The End

Editors note: This article is based largely on data, provided by The International Nickel Co., Inc., 67 Wall St., New York 5, N.Y., which was originally assembled in collaboration with **G. P. Witteman,** assistant metallurgical engineer, Bethlehem Steel Co., Inc., Bethlehem, Pa.



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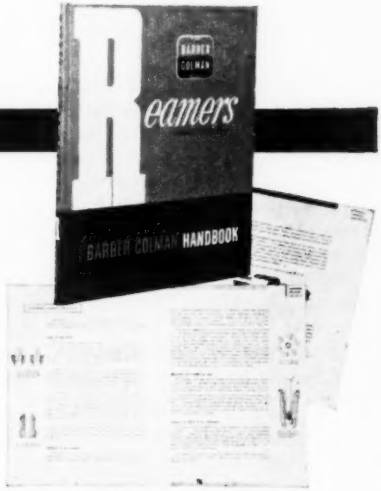

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Kneading Die Produces Steel Type Rapidly

Channel shaped blanks fed on an indexing fixture are brought under a punch that is rocked at the same time that pressure is applied. Output nearly doubled that formerly attained.

By **Herbert Chase**

EVERY IBM electric typewriter produced at the Poughkeepsie plant of International Business Machines Corporation requires 42 type slugs, each containing two embossed characters. Every character has a printing face that is curved to fit the platen around which the paper that receives the impression is curled. To insure sharply defined printing, characters must be precisely made and mounted. For proper hardness and wear resistance, steel is chosen and it has to be flowed into die recesses to form the characters.

Dies that emboss the characters are made on the ends of punches, each of which has two major character recesses and, between them, a minor recess to form a small identifying character that does no printing. Into all of these recesses, metal of the blank or slug must be forced. Naturally, the dies are hardened and are made of tough wear resistant steel that retains its shape and sharply defined cavities for long periods of use.

Although the type slug, which is of soft steel, could be subjected to sufficient direct pressure to make the metal flow into the character recesses, this pressure would be high and require heavy presses that would be slow in action. It has been found, however, that, if the die is rocked as the pressure is applied, the desired metal flow, induced by a kind of kneading action, can be effected rapidly and with a moderate pressure, permitting of light and fast machines.

Until recently, horizontal machines were employed and some are still used. They do a good job but are being replaced by standard vertical presses that are twice as fast and do an equally good job. In both types, however, the die is given a rocking motion by a crank

1. Close-up of the embossing press having dies on a horizontal indexing fixture. Slugs are loaded by hand as dies stop at the front station. At the rear station, a crank rocked embossing die on the ram kneads the slug and forces steel into the upper die recesses to form characters.

as pressure is applied to produce metal flow.

As each finished type slug is fitted over and soldered to a type bar that is a stamping 0.060 in. thick, it is convenient to make the blank slugs in channel shape with a slot of about 0.060 in. between the two legs. Slugs on which the characters are formed are made with the slot about 3/16 in. deep and are about ½ in. long parallel to the slot at its bottom but about ⅜ in. long at the top, hence the ends of the legs taper. All slugs are cadmium plated before going to the embossing press, as this coating acts to some extent as a lubricant in the embossing operation.

These blank slugs are delivered to the press setup shown in figure 1 and a handful is placed on the table attached to the bed of a 2½-ton V & O press. There the slugs are in convenient position for the operator to pick up and load in lower die blocks supported on an indexing horizontal dial that rests on the press bed. In this setup, the punch, whose lower end contains the type impressions, is attached to a rocking block that is carried by the ram of the press.

Rocking of the block is done by a crank at the back of the bed. Rocking motion is imparted every time the press ram is lowered to make the impression. Backward rocking occurs on the upstroke. When the press is in use, the ram reciprocates continuously but is above the back of the dial at the opposite diameter from the loading station.

Dial motion is positive and is timed, of course, to occur during each upstroke of the ram. Thus, all the dies on the dial come to rest during the down stroke, that at the front being loaded by hand while that at the rear holds the slug under the punch at it is lowered and rocked. All the operator does is to place the slug in a die recess that has two slots, one for each leg, at each side of a ridge that fits the slot in the blank being loaded.

When the slug or blank is indexed under the rocking die, it is forced to bottom on the ridge and the metal above the ridge is then compressed by the combined pressure and rocking motion of the die. Metal between the die and the ridge must flow, as it is confined between solid surfaces moving together. Some flows upward to fill the die recesses above. Some flows downward to slightly lengthen the legs as they are driven into tapered slots in the lower die. All remaining metal displaced flows outward on all four

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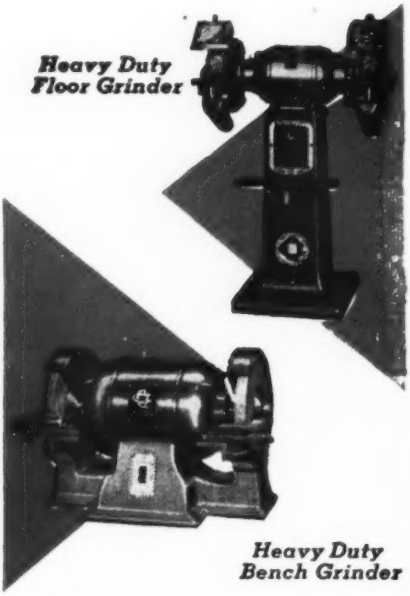

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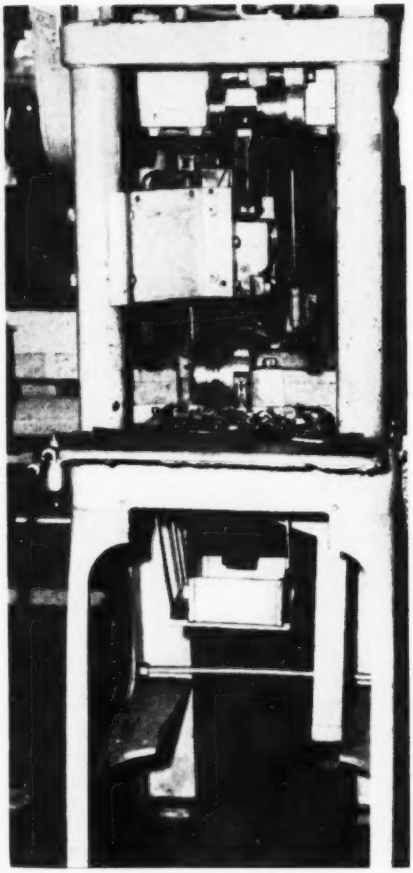

2. Press equipped with an indexing drum carrying dies that trim flash from slug previously embossed. Severed flash drops off when these slugs are forced through the dies and inside the drum.

sides of the upper die, producing flash.

After the upper die clears the work piece, the dial indexes and, during the second indexing, ejector pins are forced upward and lift the work piece out of the lower die, so that it drops out into a tote pan, leaving the die ready to be

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3. Operator loading embossed slugs in recesses of trim dies on the indexing drum. In the top position, a punch on the ram crimps the flash and, at a rear station, another punch, moving horizontally, pushes the slug through the die.

reloaded when it reaches the front station. With this setup, about twice the number of pieces are produced as in the horizontal machines.

Although characters and the adjoining face of the work piece leaving the die are finished, flash remains around the contour and is removed in the press setup, figure 2. Set in this press is an indexing drum that carries a set of trim dies and appears close-up in figure 3. This drum indexes about a horizontal axis. Each die is loaded through a hole in a clear plastic screen at the front station and well away from the top punch carried by the ram of the press that descends above the center of the drum and radial to the drum following each positive indexing of the drum.

This punch merely crimps the flash around three sides as it pushes the piece firmly against the trim die. Reciprocated at the back of the drum is a punch that pushes each slug through the trim die, thereby cutting away a U-shaped piece of scrap. Cuts are made at both sides flush with the legs of the channel and one flush with the end of the legs. Trimmed slugs, forced through the trim dies and into the drum, drop out into a tote box, leaving each die ready to be reloaded when indexing brings it again to the front position. Flash trimmed off falls away outside the drum. A small piece of flash left at one end of the otherwise finished slug is trimmed off in a later operation.

The End

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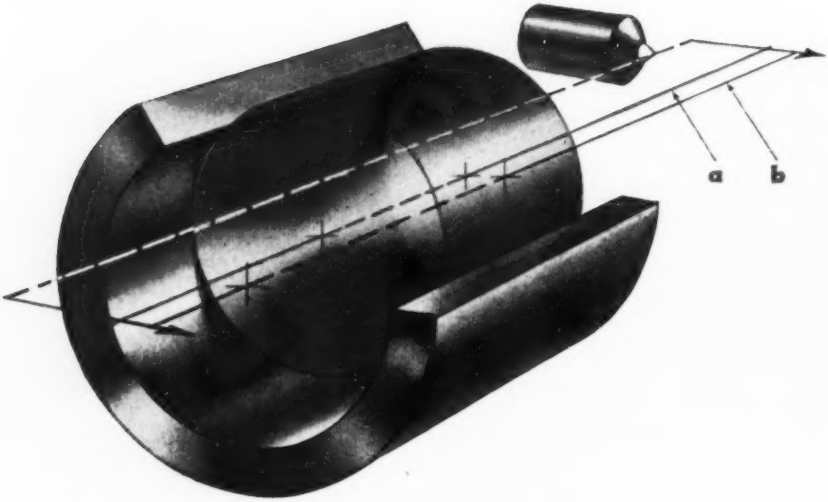
alignment

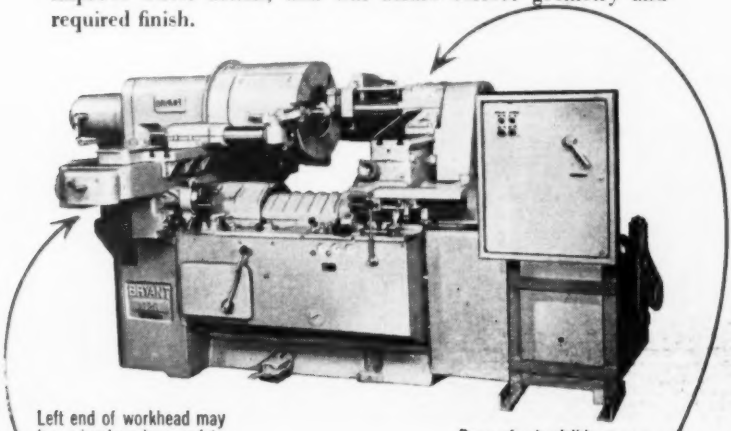
for better internal grinding



THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must lie in a plane parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This heavy-duty, semiautomatic machine, with hydraulic controls, has a 26″ swing and will grind holes with a maximum depth of 12″. Although designed for large, heavy work, a selection of wheelheads is available to grind holes as small as 1″ in diameter. The extremely rugged bed provides the strength and rigidity necessary for vibrationless operation. The workhead has two positions, one for grinding and a forward position for ease in loading and checking large work. The wheelhead is adjustable to grind work up to 15° included angle. The Bryant workhead and wheelhead slides are anti-friction to provide extremely accurate grinding and sensitive control.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

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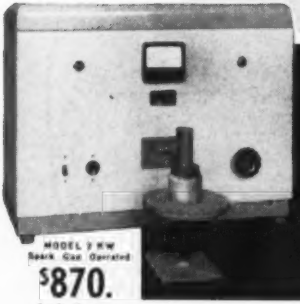

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New Trimmer Saves Operation, Lowers Tooling Costs

Produces irregular stepped contour on sides of drawn stamping in one stroke of machine with marked reduction in labor charges. Roll type beader is also employed with noteworthy results.

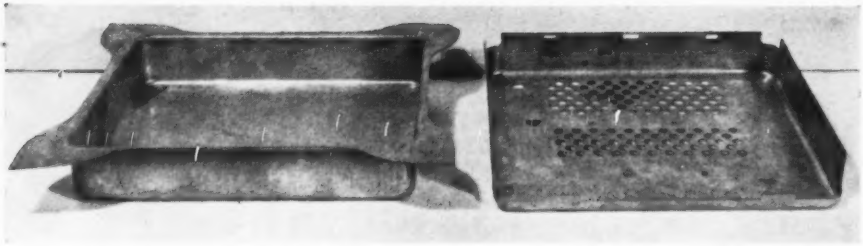
By **Paul Anstedt,** Works Manager
Northern Metal Products Company
Chicago. Ill.

RELATIVELY few machines pay for themselves out of savings, even in long runs, on a single product, but this result has been attained with a Model trimmer installed recently in the stamping plant of Northern Metal Products Company, Chicago.

Trimmers of this type are self contained units of moderate cost but trim all four sides and four corners of a rectangular drawn stamping using a single die and only one man in one fast operation. In making the cover for a radio housing, figure 1, a blank of steel is first drawn to the rectangular rounded corner shape shown. All four sides and four corners then have to be trimmed to yield the irregular stepped and notched contour illustrated.

To do this trimming by conventional means would require horn dies, each in its own press and with its own operator. Although the trimming could be done with cam dies, it would be a costly one and would require a large press. When the job is done in the new trimmer, however, only one die of moderate cost is needed.

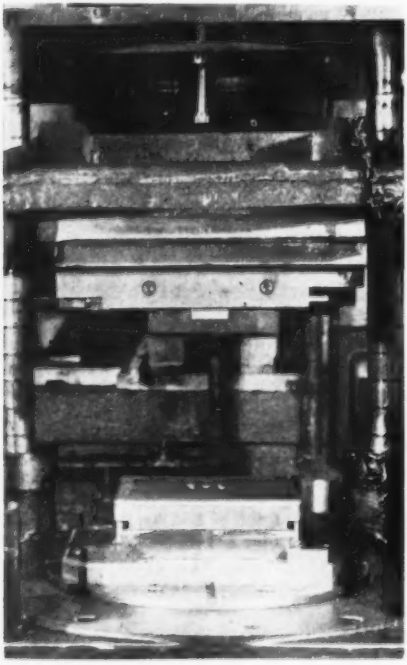
In this trimmer, figure 2, there is a central cam that operates the bottom punch components, forcing them outward in four directions as they make their shearing cuts across the edges of the top die which is moved down and held in place over the stamping while the cuts are made. All the operator need do is to load the work piece and then hold down an electric control but-



1. Drawn stamping, left, and the same part, right, as it appears after a Model trimmer has produced the irregular contour in a single fast operation at the Northern Metal Products Co. plant.

ton. This results in clamping, trimming and unclamping the piece automatically, leaving the piece and the metal trimmed off ready for removal by hand.

2. Model trimmer equipped with die that trims the drawn part appearing at the left.



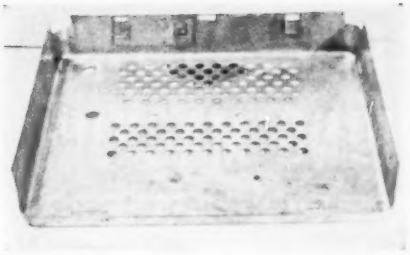
About 300 pieces an hour are handled and, as only one man is needed, labor per piece is far below that for running the piece through separate dies in as many presses. Better trimming also results, as the cuts are all made at once without relocating the piece.

There is also considerable saving in space as well as in the number of men, presses and handling operations, as the work is done in one operation, as against several. Finally, and of considerable importance, the single die required costs much less than separate trim dies would cost. Thus, there are important savings on all scores.

In figure 3 is shown a close-up of the trimmed part. Shear lugs and the elongated slot shown in the side, as well as the holes pierced in the bottom of the piece are produced in separate operations.

Among other unusual jobs done in this plant are those performed on a beading machine that has been modified to form stepped diameters on cylindrical parts previously drawn with straight side walls. A typical part on which a step has been rolled is shown at the left in figure 3 along with the modified beading machine.

To produce the step, the drawn part is set on a base equipped with four jaws, each occupying one quadrant, and over a roll that is ¼ in. smaller in diameter than the i.d. of the work piece.



3. Closeup of the piece as it appears after trimming in the die shown in 2.

After being so located, a lever is used to move downward over the drawn part a cylindrical top die having a 45° bevel or chamfer at the i.d. of the lower end. The bore of this die is slightly larger than the o.d. of the work piece.

As the cylinder is pressed down, its bevel engages mating bevels on the quadrant jaws and forces them inward so that they clamp the work piece around a full circle against the side walls of a central boss that fits the drawn i.d. of the piece. While thus clamped, a second lever is used to force the forming roll radially outward as it is rotated by a motor driving through a speed reducer.

When moved outward, the roll is pressed against the i.d. of the work piece above the clamp and expands the wall until its o.d. fits the bore of the cylinder, while the latter is kept from deflecting by rolls that bear on its o.d. As a result of the expansion of the work piece, which remains fixed, a step is formed just above the clamped portion, whose size remains unchanged. When the step is formed, levers are released and the work piece is unclamped and removed.

In the piece shown, the step formed is equal to the metal thickness. Although the step constitutes an undercut, the i.d. at the stepped neck remains unchanged and, being larger than the roll, the piece is lifted off without interference. Actually, expansion of the drawn stamping by the roll is equivalent to a bulging operation but is performed in a machine that is lighter and much less expensive than any press or die suited for bulging operations.

4. Closeup of a domed drawn stamping, left, on which a step has been produced by a rolling operation in a modified beader, most of which also is shown.

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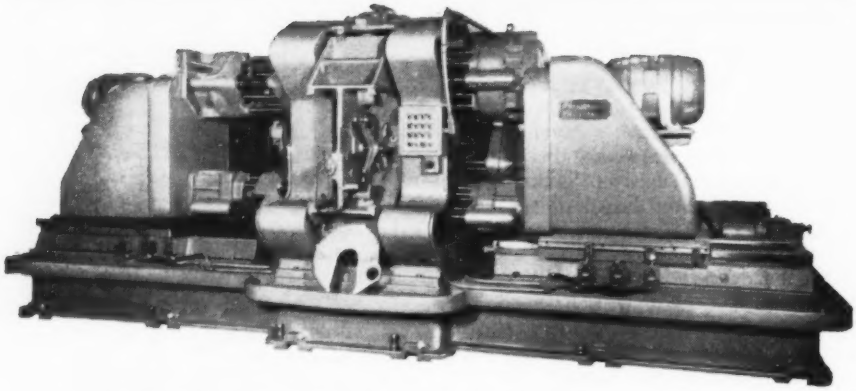

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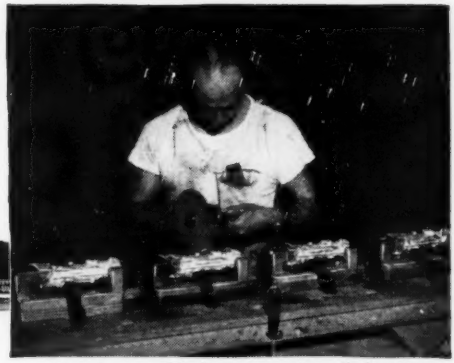

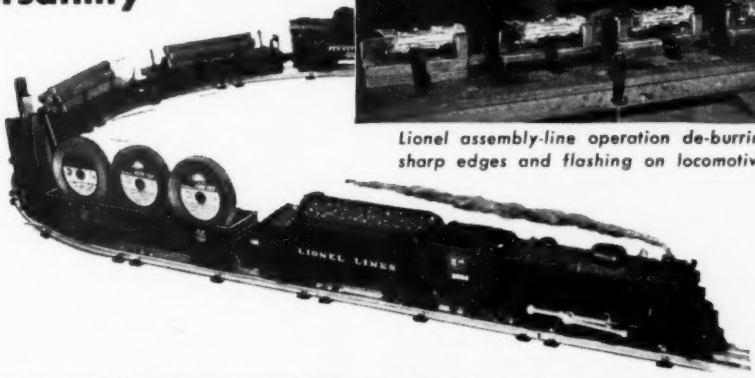

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Which New Material Shall I Use . . . ?

By **Julius J. Harwood,** Assistant Head
Metallurgy Branch, Office of Naval Research
Department of the Navy
Washington, D.C.

Industrial expansion, technological advances and military needs have caused a transition from an "era of plenty to an era of insufficiency." It has been stated that "World War II was the last war of plenty this Nation is capable of supporting." The demands of our gas-turbine industry and related developments in rockets and missiles are eating up our available supply of alloying elements and in the event of war scale production, the limited availability of cobalt, columbium, nickel and other elements will present serious problems. Hence, the search for those new materials which will tend to conserve the scarce elements.

Another reason for the search for new materials is the demand for higher strength, lighter weight, heat and corrosion resistant materials. Operating temperatures are being pushed higher and higher in the gas turbine industry, chemical industry, aircraft industry and elsewhere. Materials must withstand higher operating pressures and more severe service stresses.

The utilization of atomic reactors for power plants, both for civilian and military usage, requires materials with not only appropriate physical and mechanical properties but with favorable nuclear properties. This additional requirement eliminates most standard engineering materials from consideration.

What are some of the new materials which have been developed to meet the problems just discussed?

Titanium

THE DESIRABILITY of decreasing the weight of structures and components has resulted in a continuous, extensive search for new light-weight, high-strength materials of which the most exciting and most publicized development has been ductile titanium and titanium alloys. Its light weight, excellent corrosion resistance to certain environments, outstanding strength/weight ratio and fatigue strength/tensile strength ratio and the availability of its ores delineate it as metal of significent potentialities and applicability.

For the next several years practically all of the titanium production will be used for military applications. The military requirements for 1954 have been announced as 25,000 tons and there is some possibility that this figure may be increased. Because of their high-strength/weight ratio and

A Summary of Recent Developments . . . part 1

their mechanical properties at temperatures as high as 700° F, titanium and titanium alloys will find their primary large scale applications in the aircraft industry. The weight savings to be gained by the introduction of titanium alloys, both for air frame and engine structural components, has stimulated a large amount of development work in this field. Other prominent aircraft applications include nacelles, firewalls, shrouds and skin materials for missile and high speed planes. For jet engines, titanium alloys are being used on a limited production basis as compressor disc materials.

The present price of titanium is about $5.00 per pound for sponge, $6.00-$7.00 per pound for ingot and $15.00-$30.00 per pound for mill products depending upon the shape, size and thickness. All sponge titanium production today is made by the Kroll process (i.e. magnesium reduction of titanium tetrachloride). There is good reason to believe that within the next few years the price of all titanum end products will be reduced to approximately $5.00 to $10.00 per pound. Recognition of the need for lower cost production processes has stimulated an enormous amount of industrial new process development. The introduction of a lower cost titanium would not only increase its military potential, but would result in more serious consideration by such industries as the chemical, petroleum and food processing. One can summarize the titanium picture with the following remarks:

Up to five tons per day are currently being produced with facilities under construction to permit production of 20 tons/day. The introduction of Crane Company into the field as a major producer will provide over 10,000 ton/year capacity within the next few years. Two ton ingots are now being made and titanium is available in all conventional shapes. It has been stated that nearly any shape forged from steel can be forged from titanium. Sheet alloys of 120,000-160,000 tensile strength and forging alloys with 160,000-180,000 tensile strength will become available. Alloys capable of use at temperatures as high as 1000° F are in development states and their creep properties at these temperatures appear better than Types 304 and 403 stainless steel. Although reliability and uniformity of present commercial titanium alloys are improving, the processing and welding of alloys still remain major problems. Substantial progress has been made with small titanium castings (up to 5 pounds) and some success has been achieved with appreciably heavier castings.

Powder metallurgy techniques for

Note: The views and opinions expressed are those of the author and do not necessarily reflect the official attitude of the Office of Naval Research nor that of the Navy Department.

consolidating titanium have been improved to the point where the properties compare favorably with arc cast and wrought materials. For several applications, the use of such techniques should not be disregarded, since it affords a means whereby titanium can be made competitive with many of the highly alloyed materials.

Aluminum Alloy (SAP)

An interesting Swiss development of a strong, high-temperature aluminum alloy called SAP (Sintered Aluminum Powder) recently has attracted much attention. This new sintered aluminum product shows potentialities for use at temperatures of 800 °F, which represents a major temperature increase over the best commercial high temperature aluminum alloy. SAP is produced from fine aluminum powder by a combination of cold pressing, hot pressing and extrusion practice. SAP rods can be further cold or hot worked into sheets, shapes or drop forging. In composition, SAP is equivalent to commercial 2S aluminum but it contains between 10 to 20% by weight of aluminum oxide. Typical room temperature mechanical properties are as follows:

Tensile Strength	50,000 psi
Yield Strength (0.2% offset)	32,000-36,000 psi
%Elongation	8-10
% Red. in area	10-12.7

Exposure to temperatures as high as 900° F for as long as 100 hours results in little or no change in the room temperature tensile properties. This is believed to be due to the effect of the finely dispersed oxide phase inhibiting grain growth and recrystallization. In general the strength and creep resistance of SAP at 600° F are as much as two to five times greater than those of conventional aluminum alloys. In addition the fatigue properties of SAP are generally superior to those of aluminum alloys at temperatures greater than 400° to 500° F.

In addition to the potential importance of SAP as a structural material in its own right, it has provided a stimulus for the application of its basic principles to the development of other alloys. Work is underway with such metals as nickel, cobalt, titanium and magnesium and it is not improbable that a whole new series of Sintered Metal Products may emerge from current research and development efforts.

Ultra High Strength Steels

In the class of high-strength, low-weight components, one must also consider the ultra high strength steels. Although historically, steel is not considered as a light alloy, nevertheless when heat-treated to provide tensile properties of 260,000-280,000 psi, it has a strength/weight ratio comparable to the strongest aluminum or titanium alloys, while exhibiting superior strength and modulus characteristics.

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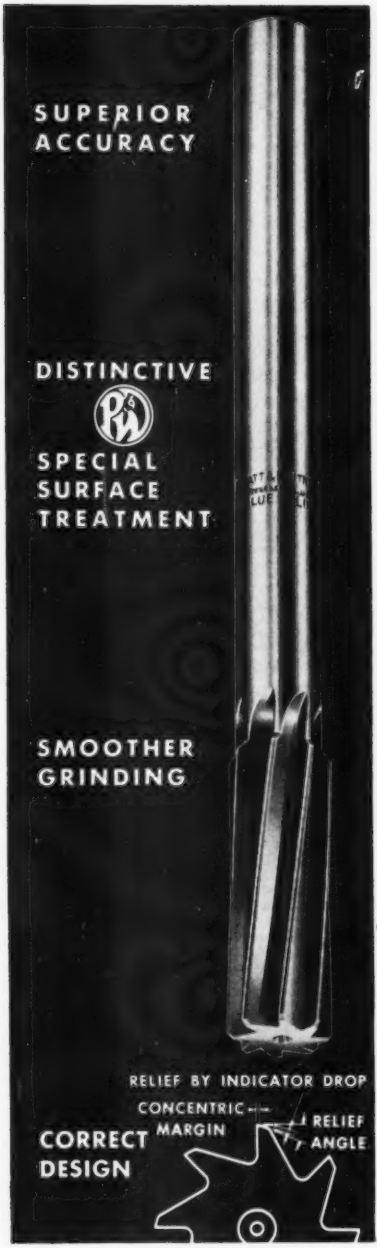

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to 475° F. To obtain maximum ductility and toughness the carbon content is kept to a minimum, consistent with the strength requirements, with a sufficient alloy content to insure complete hardenability. Typical steel compositions are of the 4340 type with the new high silicon and boron steels also receiving much attention. Landing gears for aircraft are the primary applications at the present time because of the weight and space saving attractions which ultra high strength steels offer. Typical design properties under consideration are tensile strength 260,000 - 280,000 psi, yield strength/tensile strength ration 75 - 80%, elongation - 10% in 2". The major hazards, in addition to lack of service experience, involve the possibilities of embrittlement during tempering and hydrogen embrittlement resulting from pickling and plating operations. Some recent research indicates that silicon and boron serve to increase the resistance to tempering and shift the loss of impact resistance which normally occurs in steels when tempered between 500-700° F, to higher tempering temperatures. As service experience increases, the use of ultra high strength steels for other aircraft components will be considered as well as its use in other industries where weight and space savings are important.

A note of caution concerning the high strength steels: although aluminum alloys of much less ductility and impact resistance are presently being employed quite satisfactorily in the intended applications for these steels, comparison on the basis of ductility and impact values may be quite misleading and dangerous. The lower modulus of aluminum which assists in energy-absorption of shock loads and the brittle failure tendencies of steels under certain conditions must receive consideration. The possibility of rapid crack propagation and brittle failure under conditions of notches and impact loading must always be borne in mind. Tests, simulating as closely as possible service loading conditions on actual parts, should be conducted whenever the use of such high strength steels is proposed for conditions involving impact loading or where stress concentration factors may be present.

Precipitation Hardened Stainless Steel

Another ferrous alloy development which is receiving attention these days is the use of precipitation hardened stainless steels. Utilizing less nickel than 18 - 8 and readily hardened by the precipitation of intermetallic compounds during heat treatment, these steels have attractive strength/weight ratios at room temperature. At elevated temperatures up to 700° F the ratio is comparable to the best of the light alloys. These steels can be formed by cold working or hot working in the soft condition and then treated in the temperature range of 850 - 1400° F to develop strength characteristics equivalent to many carbon and low-alloy steels. Welding operations can also precede the final precipitation treatment and the welding characteristics are similar to types 302

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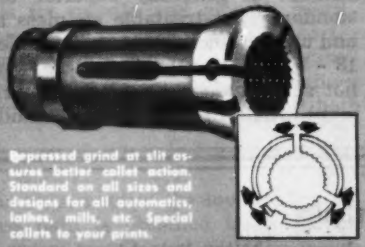

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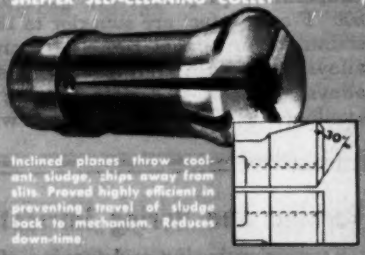

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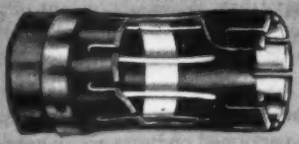

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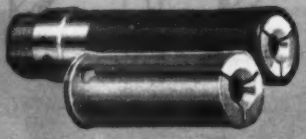

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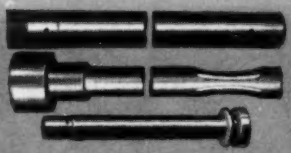

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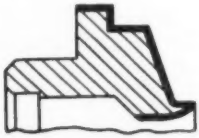
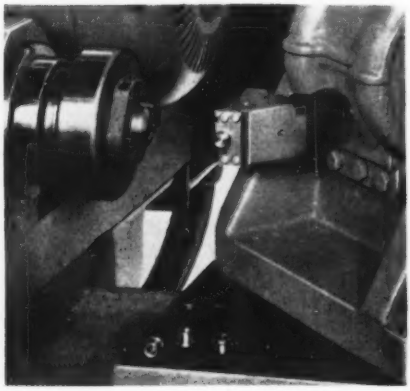
and 304 without requiring any preheat or post heat anneals. The high temperature properties are good up to 800° F and in fact are superior to 18 - 8 stainless, low alloy steels, titanium alloys, aluminum alloys or magnesium alloys. These new stainless alloys are available in sheet, strip, bars, wires, forging billets and some varieties are good casting alloys. Their corrosion resistance is generally superior to the standard heat-treatable stainless steels and under some conditions equivalent to 18 - 8. Like the 18 - 8 variety they are not susceptible to hydrogen embrittlement. Their high elastic limit and en-

Turning and Boring Intricate Contours

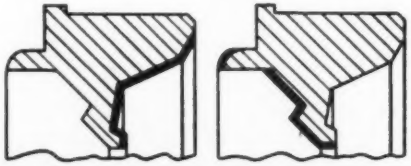
Production boring and turning of intricate contours on small parts can be done on standard Ex-Cell-O precision boring machines. A single-point cutting tool is held in a standard, motor-driven cam boring unit which is an adaptation of Ex-Cell-O's universal cam-type dresser. Normally this dresser uses diamond tools to form grinding wheels to the precise shape required in grinding threads. Its accuracy and dependability have been proved over a period of many years on precision thread and form work. Adapted for boring or turning it employs solid carbide or carbide tipped tools to generate the desired form.

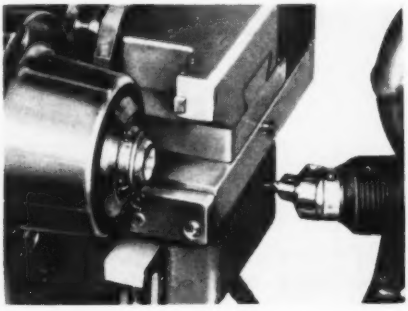
1. Two tools are used in one holder to machine these surfaces of a stainless steel spray tip. One tool does the straight bore blending into a spherical radius, second tool cuts external contour. Other surfaces are done in a similar operation.





2. The drawings show two of many operations performed on brass spray nozzles with the setup at left. The small slide at the rear does auxiliary operations.





durance strength and good high-temperature properties make the precipitation hardened stainless steels attractive materials for missile and aircraft manufacture. They are being considered for compressor blading, aircraft landing-gear parts, valves and other applications where resistance to oxidation and high stresses are required. They also appear to be promising spring materials.

Reinforced Plastics

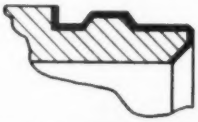
No discussion of high strength, low-weight materials would be complete without mention of the rapidly expanding field of reinforced plastics. Two of

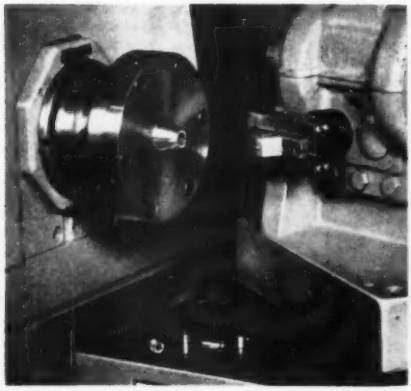
---

The movement of the tools in the required path is obtained by a ground lead screw coordinated with the movement imparted by a ground cam. The drawings and photographs show examples of the forms obtainable.

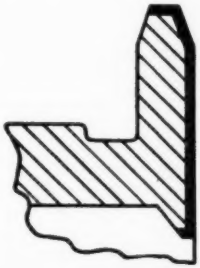
The work is held in a suitable chuck and the cam boring unit is mounted on the machine table. The rapid traverse movements of the table are utilized to bring the tool to the work and to withdraw it to allow ample room for loading and unloading. The complete work cycle is automatic. Machines equipped for contouring work often accommodate several different parts. New setups are obtained by changing the cam, tool and chuck details.

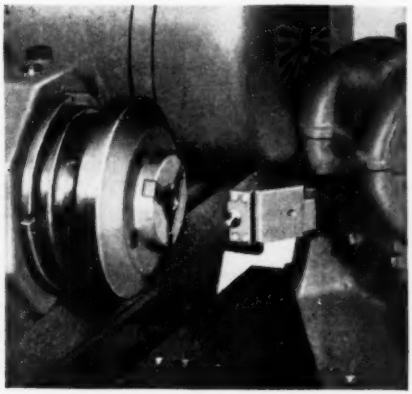
3. Another standard Style 2112-A machine equipped for contouring. The parts are small steel hydraulic components.





4. Two tools cut the surfaces shown on a stainless steel nozzle tip. One tool does the short, straight bore, the second tool finishes the other three plane surfaces.





the most recently publicized items have been the use of reinforced plastics as body armor in the Korean war and the recent introduction of plastic car bodies in the automotive industry. In the broad sense the term reinforced plastics covers any mixture of plastic and fibrous materials. The fibers provide the main strength characteristic and the plastic resin serves to make the material moldable and to provide body. Glass, cotton, rayon, nylon, asbestos, paper and cloth have been used as reinforcing fiber materials, with glass fiber or fiberglass mats being the most commonly used reinforcement. A host of resins may be used, including phenolic, silicone, epoxy, melamine, polyester, and others. The most widely used resins are the polyesters for low pressure laminates and the phenolics for high pressure laminates. The properties of the reinforced plastic depend upon the type and amount of fiber, the particular resin and the method of processing. All are important factors in determining the final state of the laminate. The choice of resin is determined by the service requirements of the part.

The main advantages of the glass reinforced plastics lie in their high strength/weight ratio which is greater than most structural materials; their corrosion resistance to sea water, mild acids and bases, solvents and other chemicals; their weathering resistance; their excellent insulation and non-magnetic characteristics; their dimensional stability over a wide range of temperature; their resistance to moderate elevated temperature (up to 500°); their shock resistance (resiliency); their non-strategic nature; their cheap moldability involving low die costs; and their adaptability to making complex shapes.

Reinforced plastics in general are not cheap; their price ranges from $0.80 to $1.25 per pound for economical section sizes. In any application, their cost must be balanced against their material properties. In reviewing this field it is difficult not to become thoroughly impressed with the enormous potential of reinforced plastics as semi-structural materials. As with all new materials misapplications should be avoided. Despite their many favorable characteristics, reinforced plastics should not be considered as a universal substitute for metals.

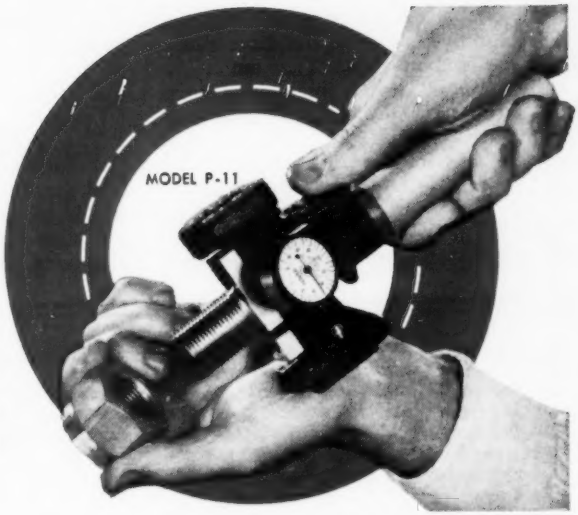
The more prominent uses of reinforced plastics are radomes, electrical insulators, hardware in motors and generators, small boats, metal forming dies, home appliances and industrial equipment parts, aircraft ducting and other aircraft semi-structural parts. It should be remembered that the moduli of elasticity and flexure of reinforced plastics is low, so that for structural parts involving flexural loads, at least twice the thickness of steels would be required to provide the necessary rigidity. The low ductility and non-uniformity are other shortcomings.

In addition to their attractive physical and mechanical properties the reinforced plastics are valuable in the unlimited sizes and shapes which can be readily molded. They have substantially lower tooling costs than for metal processing which provides an economic advantage where short production runs or a variety of different shapes are desired. For example a die cast aluminum part required a $25,000 die whereas the die cost for producing the part from a glass reinforced polyester was only $3,000. For quantity production run parts, however, the high cost of the resin as compared to most commercial metals would offset the initial low tooling costs.

Nylon Powders

The development of finely divided nylon powders has made possible the application of powder metallurgy techniques for the production of nylon bearings. Pressed and sintered nylon bear-

BRYANT GAGE FOR INTERNAL THREADS



The P-11 is a portable comparator gage. Variation from basic size of pitch diameter, form and lead are shown in a single reading on the dial indicator accurate to .0005". Interchangeable pairs of segments inspect all classes of threads in a range from 5/16" to 5" diameter.

The gage segments work on the principle of an expanding master plug. A thumb lever collapses one segment so that the part can be loaded. When the lever is released the segments engage the thread. The movement of one segment registers on a precision dial indicator which shows the accumulated amount of variation from basic size. The segments are made to the same tolerances in P. D., form and lead as a class "W" master. The segments are attached by four screws. Periodically the segments are checked to a master ring gage and the "0" setting of the indicator is adjusted accordingly. Worn segments may be returned to the factory to be reground. Dirt or cutting oil cannot affect the working parts of the gage as there are no slides or pivots. The indicator may be turned on the axis of the stem to keep the dial visible. This gage weighs only 14 oz. without the segments.

This gage is designed for use at the inspection bench or in the shop. It is used for quality control since complete control of the thread cutting process is possible. The indicator reading of variation from basic size tells exactly where within limits the work is running. For this reason also, the gage is used for checking tool wear in production jobs.

Please send descriptive literature covering the P-11 gage and other Bryant gages.

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ings exhibit excellent wear resistance and good low frictional and dimensional stability characteristics. They suffer less from internal strains than nylon parts made by injection molding or machined from extruded rod. Filler materials may be added during the pressing operations to impart self-lubricating, electrical conductivity, magnetic or higher strength properties. For example; pressed nylon with 20% lead is used for oilless bushings. The sintered nylon bearings are finding increasing usage as bushings, brush holders, gears, cams, etc. In many instances they outlast metal powder bearings by more than 2 to 1. The application of powder metallurgy techniques greatly broadens the industrial possibilities of these synthetic materials, which in the case of nylon moldings now exceeds over 800 types of applications.

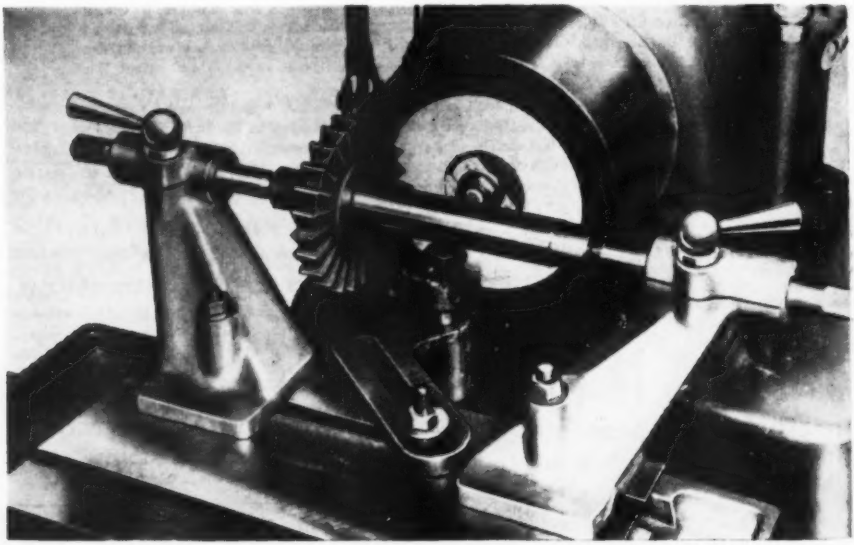
Machine performs 50 metal-working operations

A new, unique concept in metal-working machines is revealed in the new Newage Rindis. It is said to perform over 50 different operations quickly, accurately, economically. It is distributed by Newage International, Inc., Dept. BB, 235 E. 42nd St., New York, N.Y.

The basic unit of the Rindis is universal insofar as it produces all the movements and the full range of speeds expected from any type of machine tool. A whole range of accessories are supplied in the form of complete units. As soon as any of these units are fitted to the basic unit the entire setup becomes a single purpose machine tool.

The versatility of this machine is

Cutter grinding. With the addition of centers, an indexing finger, and the arbor from the horizontal milling attachment, the Rindis will grind most types of milling cutters rapidly and efficiently, it is said.



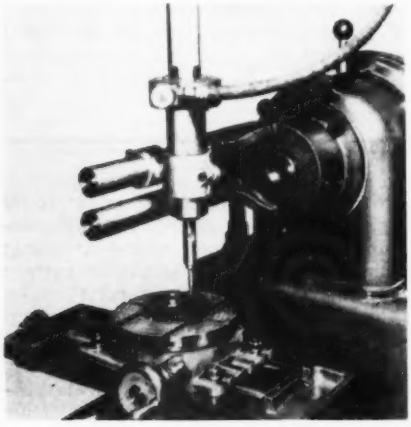
An increasing popular method by which rigidity and low weight may be concurrently achieved is the use of sandwich construction. Progress in the development of adhesives and fabrication techniques have made possible a variety of metal facing or non-metallic facings with foam or honeycomb type cores of either plastic or metallic nature. Sandwich construction may be used to compensate for the low modulus of the reinforced plastics where rigidity is required but with some sacrifice in impact resistance and with increased fabricating costs. Metal faced sandwiches bonded to cellular cores, which are generally corrugated metal foils or castable foam plastics, are finding uses as rigid panels, contoured shapes in aircraft, tail or wing assemblies, fireproof doors etc. The strength of these sandwiches depend

---

suited to experimental and research laboratories, machine and engineering shops, technical schools, colleges and universities, model shops, mobile workshops and tool and die rooms. In the basic unit, the drive from the motor gives a range of 24 spindle speeds from 65 to 2,800 r.p.m. Two locating pads are machined at the front of the head for the accurate location of the various attachments. The rise and fall compound table is provided with micrometer dials and a rack and pinion. The simple construction and wide variety of attachments enable it to carry out almost any machining operation rapidly and economically, the manufacturer says.

High speed routing. With the patented Lorantco turbine air grinder mounted on the horizontal milling attachment, the machine can be converted into a high speed router, using engraving tools, end mills, slot drills or carbide burrs. Speeds from 20,000 to 20,000 r.p.m. are possible. The same air grinder can also be used for internal grinding. Air pressure required is from 60 to 100 pounds.

Operations claimed for the machine include: bandsawing; boring; centerless



The basic machine

on the core density, overall sandwich depth, the type of facing and facing thickness and the adhesive bond. With metal sandwiches, the metal facing carries the major portion of the load and the type of facing alloy is determined by the service use. The improved resin adhesives which have been developed allow the bonding of a variety of metals to metals and of metals to non-metals. One of their limitations will be the relatively poor bond strength at elevated temperatures. Fabrication of sandwich materials requires good bonding procedures, careful inspection practice and maintenance of quality control.

High Temperature Materials

There is in progress a concentrated effort for the development of materials capable of withstanding highly stressed operating conditions at temperatures above 1800° F. Few applications demand the combination of stresses, temperature, time and critical dimensions required for gas turbine parts. Research programs are being concentrated, therefore, along two major directions; the development of new refractory alloy systems and the development of metal bonded refractory compounds commonly called cermets.

The refractory metals, so called because their melting points are greater than 3000° F, include a group of elements which were formerly used mainly as steel alloying ingredients. Molybdenum and its alloys has been selected as having the greatest potential for super high temperature service. Its abundance and availability in this country and its known high temperature properties make it one of the most promising hopes for the solution of the difficult problems involved in gas turbines. Alloys already have been developed which show outstanding stress rupture properties at temperatures as high as 1900° F. There is no reason to doubt that continued work will result in alloys for use at even higher temperatures. Their satisfactory engineering development would permit an increase in gas turbine operating temperature of approximately 300° F.

Several obstacles still must be overcome before molybdenum alloys can receive widespread military applications. Satisfactory protective coatings are urgently needed to prevent the rapid oxidation which molybdenum and its alloys undergo. Certain brittle characteristics which cause welding fabrication and service difficulties must also be overcome. Gas turbine manufacturers are now evaluating molybdenum alloy turbine blading and the opinion exists in some quarters that the only factor preventing their use is the lack of reliable protective coatings. Nickel and nickel alloy coatings appear promising in this respect for use up to 1800-1900° F.

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grinding; centering; chamfering; circular die grinding; cross drilling; cup wheel grinding; cutting-off with circular saw; cutting-off with high speed; abrasive wheel; cylindrical grinding (between centers); de-burring; die grinding; disc sanding; end milling; external grinding; face milling; filing with 12" circular disc; form grinding (with air grinder); gang milling; gap gauge grinding; heavy duty disc grinding; hob grinding; horizontal milling; internal grinding; keyway cutting; lapping; polishing; reciprocating slotting; routing; rotary filing; sawing; second-operation work; slitting; spline grinding; spline milling; spur gearcutting; surface grinding; taper grinding; taper turning; tap re-grinding; thread milling; tool and cutter grinding; trimming; twist drill grinding; tungsten carbide grinding; turning; valve grinding; vertical milling; woodruff keyway milling.

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Aside from high temperature applications there are other industrial uses for which molybdenum and its alloys may prove practical. Their use as die materials for die casting brass and other relatively high melting alloys appears most promising. Piping, tubing, liners and valve applications in the chemical and related industries can take advantage of its corrosion resistant properties.

In contrast to its early usage in the electronic tube industry the forging and rolling of massive molybdenum have advanced to the stage where equipment size limitations represent the major problems in working large pieces. One half ton ingots can now be made and molybdenum is available in forgings, sheets, shapes, and tubing. One significant feature of the emphasis on molybdenum is the fact that the United States is the leading producer of molybdenum concentrates, mining more than 85% of the world's output. There is little doubt that as a result of the government and industrial programs now underway, molybdenum will occupy a promising position as a structural engineering material.

Parallel research and devolpment are underway with chromium and its alloys. It has been known for several years that chromium base alloys exhibit good high temperature properties at temperatures as high as 1800° F. Their extreme brittleness, particularly at room temperature, however, discouraged their use. Recent work by the Bureau of Mines and others have improved the ductility of chromium to the extent that it can be worked at moderate temperatures.

Metal-Ceramic Combinations

As a result of research during the past few years a completely new series of metal-ceramic combinations, known as cermets, has emerged as potential structural materials. Although most of the

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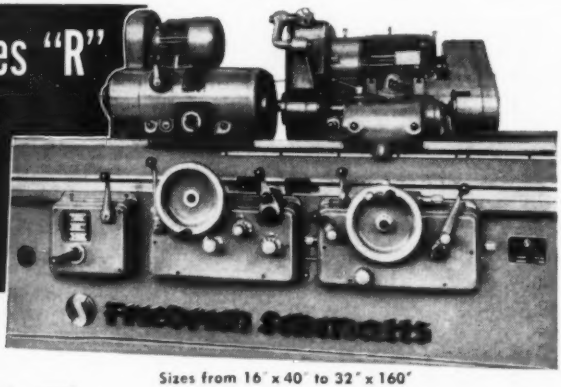

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development work was aimed at materials for the turbine end of the jet engine, as either turbine blades or nozzle stator blades, the properties of many of the cermets make them attractive for a variety of applications. Early investigations dealt primarily with oxide compositions, but the major current effort is on metal bonded carbides, borides, silicides and aluminides. These types of materials are fabricated into shapes by powder metallurgy techniques.

As of this time the most advanced cermet development is the cemented titanium carbide composition. A variety of compositions have been developed: the most interesting grades employing combinations of nickel, chromium or cobalt as binder materials in amounts ranging from 25 to 60%. These metal bonded titanium carbides exhibit strength properties up to 1800° F, oxidation resistance, and thermal shock characteristics which have led to their serious consideration and evaluation as turbine blade materials. Since the carbides have densities ranging from about 5 to 6 g/cc or 2/3 as heavy as our present alloys, the centrifugal stresses developed would be proportionately lower. On a strength/density basis the high temperature properties of titanium carbide compositions are superior to those of many alloys by a substantial factor.

Depending upon the nature and amount of the binder, the transverse rupture strength at room temperature of the cemented carbide ranges as high as 225,000 psi and at 1800° F is as high as 150,000 psi. The metal bonded titanium carbides can be fabricated into a variety of shapes by direct pressing, extrusion or machining.

The major problems confronting the possible use of carbides or other cermets as turbine blade or vane materials are their lack of ductility and the uncertainties concerning their reliability and uniformity. While the lat-

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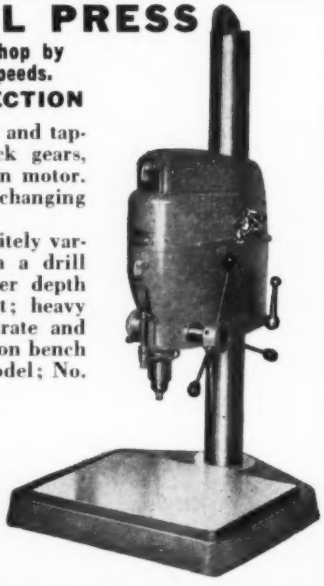

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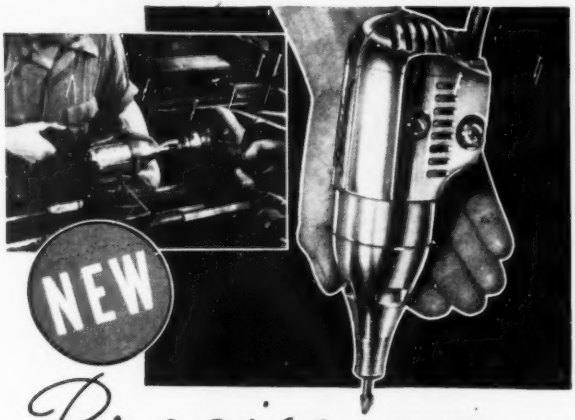

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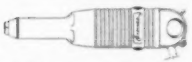

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ter situation would be alleviated as production techniques and know-how improve, the former is serious enough so as to cause considerable doubt in some quarters concerning their use in such applications. The probability of particles and fragments coming through the engine with considerable velocity requires that blade and vane materials have some impact resistance. Increasing the binder content of the cemented carbides to provide such ductility causes a marked reduction in their high temperature strength properties.

Boride Compositions

In the field of boride compositions it appears that zirconium boride base compositions may be extremely useful for applications involving contact with molten metals such as aluminum, copper, brass, magnesium and tin. Their inertness to molten aluminum has led to the evaluation of zirconium boride

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as pump components for aluminum die casting applications. The ability to obtain good surface finish and the maintenance of close dimensional tolerances are other important features which make the borides of interest for such applications. Zirconium boride also is being used increasingly as thermocouple protection tubes in molten brass and copper. Another promising application of zirconium boride is the use of nozzles for spraying magnesium powder. A molybdenum boride composition known as Mo braze, has been shown to be a satisfactory brazing material for molybdenum and tungsten.

Research on the borides has resulted also in the development of compositions which exhibit attractive promise as cutting tool materials. If this development is successful, it would represent a significant step forward in the conservation of tungsten and cobalt. At this time, mention should be made of some

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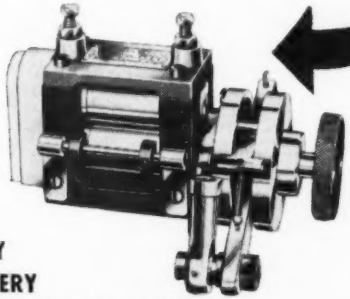

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MAINTAINS ORIGINAL SETTING . . . regardless of use or wear. No ratchets or pawls to wear down and "throw off" feed spacing.

EARLY DELIVERY ON STANDARD MODELS.

ROLL-FEEDS CORP.
An Electrix Affiliate
Pawtucket • Rhode Island

Write today for latest Bulletin

recent cutting tool materials developments in Great Britain. Bonded Al_2O_3-Cr_2O_3 compositions have exhibited useful cutting tool qualities and, while more brittle than conventional tungsten carbide tools, with suitable handling have given remarkable performance. These oxide tools are now being commercially marketed. Other carbides, including titanium carbide compositions, also are under development as cutting tool materials.

In the field of silicides, recent announcements have publicized the use of silicide coated molybdenum or molybdenum silicide itself for heating elements. Molybdenum disilicide has good high temperature strength and thermal shock resistance, excellent oxidation resistance and appropriate electrical properities which make them useful materials for furnace heating elements. The upper temperature limits of these silicides are several hundred degrees

Give your O. D. grinding the "TOUCH of GOLD" with Norton G Bond wheels

Throughout the range of cylindrical and centerless grinding, the new Norton G Bond wheels are chalking up sensational records for more units per dressing, per hour and per wheel. The G Bond has the unique ability to hold abrasive grains *just long enough* for maximum cutting action — assuring constant, fresh, sharp cutting wheel-surfaces. Users everywhere report they cut cooler . . . remove material faster . . . produce a better finish . . . produce more pieces per dressing . . . hold shape better . . . and crush-true more easily.

ASK YOUR NORTON DISTRIBUTOR for a demonstration of how G Bond wheels will add the cost-reducing "Touch of Gold" to your O. D. grinding. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Mass.

W-1512

NORTON ABRASIVES

Making better products . . . to make other products better

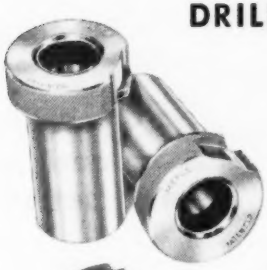
higher than present globar units.

Nuclear Reactor Materials Developments

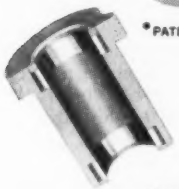
Nuclear reactors may well supply a significant part of the world's increasing energy demands. It has been indicated that one of the factors involved in the successful development of a substantial nuclear power industry is the available as titanium and at the present high temperature strength properties, corrosion resistance under conditions of high velocity, temperature and pressure, resistance to mechanical damage from neutron bombardment, radioactive stability and low cross section for neutron absorption. The last requirement may be a most significant economic factor. The efficiency of nuclear conversion depends to a great extent upon a low parasitic absorption of neutrons by structural materials. In addition, low cross section neutron absorption matrials are needed

INCREASE PRODUCTION.. SAVE TIME & MONEY

ON YOUR DRILLING OPERATIONS



*PATENTED



MEYCO

Carbide Inserted Bushings last longer, cost less in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 15

W. F. MEYERS CO., INC., BEDFORD, INDIANA

to avoid secondary shielding and maintenance problems.

Zirconium was found to be an outstanding metal with low thermal neutron absorption for nuclear reactor purposes. Its high melting point, corrosion resistance and its useful high temperature properties up to about 1000° F combined with its nuclear properties make it a most attractive metal for such applications.

The development of ductile commercially pure zirconium and its alloys has paralleled somewhat the development of titanium. Methods of production and fabrication and many chemical structural and metallurgical characteristics are similar. Zirconium ores are not as available as titanium and at the present time, zirconium is more expensive than titanium. The cost of Zirconium sponge made by the Kroll process is $15.00 per pound. While practically all of the production at present goes for atomic energy uses, it is worthwhile to note that these uses do not involve by any

CHAMPION
E-X-P-A-N-D-I-N-G
MANDRELS

Precision Model

Standard Model

give *speed to* every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

Precision Model has expansion range of .010". Available in regular sizes to fit holes from ½" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from ½" to 9½" diam.

CHAMPION *Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.*

WESTERN TOOL & MFG. CO., INC.

Dept. 27 **Springfield, Ohio**

means a major consumption of the zirconium production potential. Plentiful supply could be available for other industrial uses.

The non-toxic nature of zirconium and the adaptability of human tissue to its presence in the body has led to its increasing use for surgical applications. Zirconium is being used for bone screws, plates, wires, and other forms in human bodies.

Of particular interest is the resistance of zirconium to many chemical media which should make it attractive for future use in the heavy chemical industry. Its resistance to alkali attack is outstanding and with many acids its resistance is quite good. In many media zirconium is superior to tantalum, tanium or 18-8 stainless steel. A suitable reduction in cost might make the use of zirconium for such things as cooking

LEVIN®

MICRO-DRILL PRESS

for holes as small as .002"

Designed to hold small drills in precision collets. Absence of a sliding quill guarantees extreme sensitivity with finger-tip control. A mounted ⅛" capacity drill chuck can also be used.

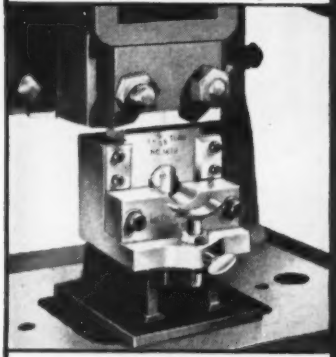
Write for Bulletin H describing the Micro-Drill Press and listing collet sizes. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, California.

utensils and household kitchen appliances quite likely to replace stainless steels.

Ductile Vanadium

The search for metals with favorable nuclear properties also stimulated the development of ductile vanadium. Although the main use of vanadium at present is as a ferro alloy, its availability in this country, corrosion resistance in reducing media, workability and mechanical properties will undoubtedly lead to application development and industrial usage. Vanadium is produced by the reduction of its oxides with calcium. Ingots can be processed by powder metallurgy techniques, or by arc-melting. One of the attractive features of vanadium is its relatively low work hardening rate during cold working operations. It can be cold worked 90% without any intermediate anneal provided the oxygen and nitrogen contents

Notch 12
PIPE ENDS
per MINUTE
Make Perfect Joints for Welding or Brazing



ARC-FIT
REG. U.S. PAT. OFF.
NOTCHES CLEAN
NO FINISHING
NO DEFORMATION
Standard ARC-FIT in hand or power press shears contours for "T" joints for ½" to 2" pipe or tubing with easily interchanged dies.
Special ARC-FITS for larger sizes, angles other than 90°, slotting or notching square pipes, angle iron or flat stock.
Standard Arc-Fit works well in our special HAND PRESS

Send for Descriptive Literature
VOGEL
TOOL & DIE CORPORATION
1825 N. 32nd AVE · MELROSE PARK, ILL.

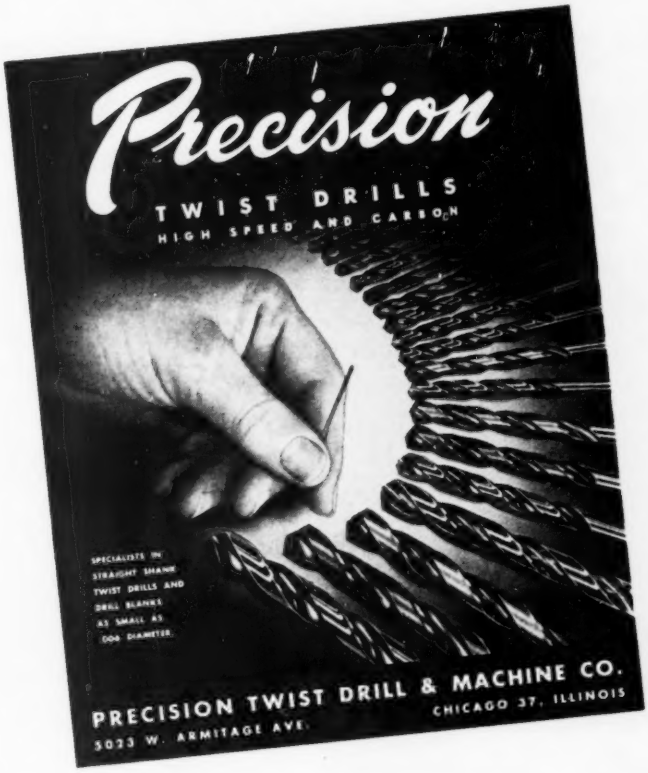
are kept below a minimum. Thus the material can be bent and formed in the cold rolled condition. Conventional fabrication procedures and shielded arc-welding techniques are applicable to vanadium. Ductile vanadium is now made consistently on a commercial production basis, although the scale is geared to a low level. The cost of massive vanadium is about $30 per pound, but this would be reduced appreciably as production quantities increase. The modulus/density ratio of vanadium is equal to that of steel and higher than for titanium which make it attractive for structural parts where flexural rigidity is required. Its tensile properties indicate its utility as a spring material. It is resistant to pitting and corrosion by sea water and salt spray. Its corrosive resistance in reducing acids is equivalent to Hastelloy C. Up to 600° C, the tensile strength of vanadium is superior to type 304 stainless and between 600° C - 1000° C it has comparable strength. Vanadium, however, has poor resistance to oxidation.

Hafnium is another metal system which has been introduced as a result of atomic energy research. Its characteristics, production and fabrication are similar to that of zirconium and titanium. It has no present commercial applications but its similar resistance to acids as titanium, may result in some specialized applications for corrosion resistance.

End of part 1. Part 2 will appear in the November issue.

CAM MILLING
Fully equipped modern machine shop with extensive **Jig Boring, Surface Grinding** and **Horizontal Boring** facilities as well as modern **Rowbottom Cam Milling** equipment.
Your Inquiries Answered Promptly
HIMOFF MACHINE CO., INC.
23-22 44th Road Long Island City 1, N. Y.

For the Finest Small Twist Drills


Precision
TWIST DRILLS
HIGH SPEED AND CARBON
SPECIALISTS IN STRAIGHT SHANK TWIST DRILLS AND DRILL BLANKS AS SMALL AS .006 DIAMETER.
PRECISION TWIST DRILL & MACHINE CO.
5023 W. ARMITAGE AVE.
CHICAGO 37, ILLINOIS

Write for this New Catalog and Price List

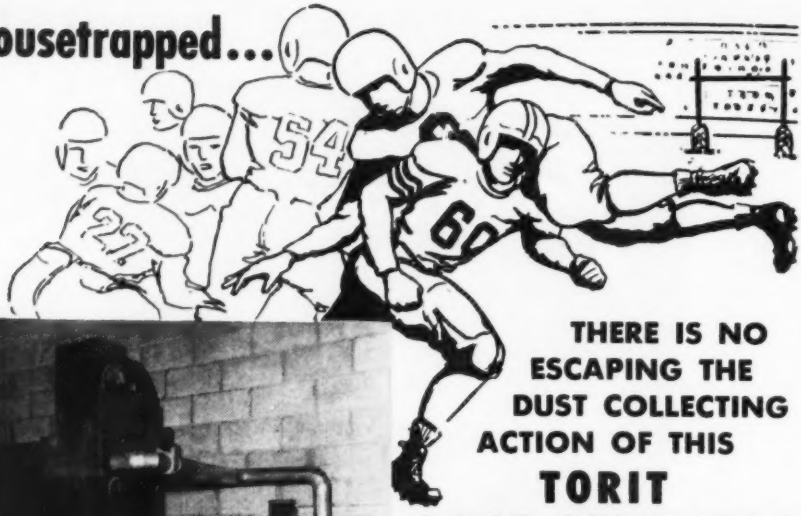
"Any Precision made drill or tool must not only be entirely satisfactory to you, but must prove to be the most economical you have ever used or it can be returned for full credit."

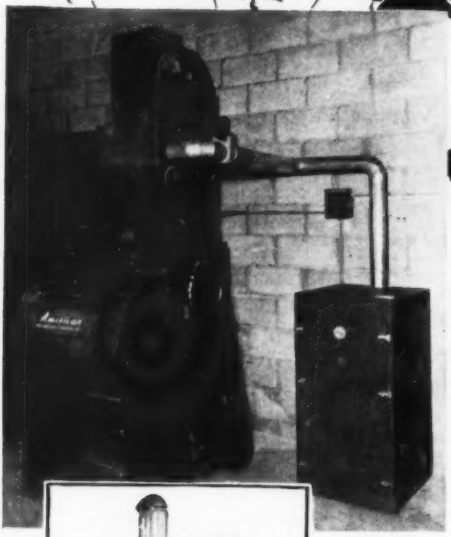
THIS IS OUR GUARANTEE!

PRECISION TWIST DRILL & MACHINE CO.
5023 W. ARMITAGE AVE. CHICAGO 37, ILLINOIS

SOME DESIRABLE TERRITORIES OPEN FOR DISTRIBUTION

Mousetrapped...





THERE IS NO ESCAPING THE DUST COLLECTING ACTION OF THIS TORIT DUST COLLECTOR

In this Wheelabrator fine, abrasive dust particles circulate into the upper chamber. They are *through the line* ready to do damage, when they are *socked* by the powerful suction of this Torit No. 75 Dust Collector. It's a *mousetrap* play that's paying big dividends in cleaner working conditions and better employee relations.

When you are looking for *high scoring* production it pays to have Torit Dust Collectors on your *team*. Compact and self-contained they fit easily into production *lines*. Sturdily constructed they are *sixty minute players* with practically no time out for repairs or maintenance.

Torit also manufactures a line of cyclone type dust separators. Sizes up to 5 H.P., with or without after-filters.

see our catalog in MACHINE TOOL CATALOGS or write for copy

To learn how Torit Dust Collectors can help produce a *winning team* for you just write:

TORIT MANUFACTURING CO.

303 Walnut Street St. Paul 2, Minn.

See our booth, No. 1641, at the NATIONAL METAL EXPOSITION

CUT... OPERATING — MAINTENANCE — SPOILAGE COSTS!

ON YOUR TAPPING JOBS!

Procunier Tappers are the last word in economical, efficient, high speed tapping. More and more manufacturers are realizing that Procunier offers them the solution to their steadily rising production costs on many tapping operations. Only Procunier has the unique construction features that permit inexperienced operators to tap like experts. Procunier Tappers provide many extra hours of continuous, accurate tapping without frequent "down-time" interruptions. Procunier Tappers are producing more — with fewer rejections, fewer spoiled pieces and a minimum of broken taps. There are many reasons for Procunier's superiority in the tapping industry. Here are just a few of the many remarkable mechanical improvements that only Procunier provides: new sensitive double cone friction clutch; soft cushioned action driving pressure; ballbearing equipped; heat treated gears; special balanced gear reversing mechanism; smaller-lighter more accurate tru-grip tap holder; and many others.

NEW "TRU-GRIP" Tap Holder

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

Write for FREE Brochure

Giving full particulars on the complete line of Procunier Tapping Machines. Learn how you can adapt them to your specific needs.

PROCUNIER SAFETY CHUCK CO.
14 S. Clinton St., Chicago 6, Ill. Dept. 10

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name .....

Address .....

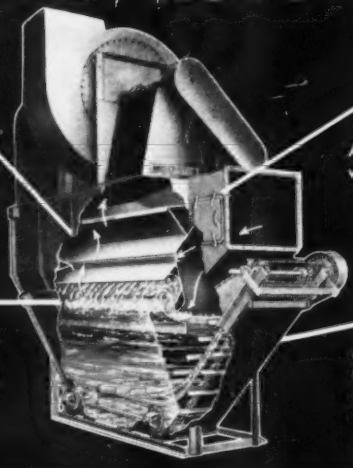
City ..... Zone..... State.....

Procunier

Safety Chuck Company

14 S. CLINTON ST. CHICAGO 6, ILL.

NEW Design 4 Type N ROTO-CLONE



1. Improved and simplified entrainment separators further reduce Type N's low-cost maintenance.
2. Greater range in permissible water over-flow rate from control box.
3. Additional access doors with improved hinges.
4. Addition of 4 larger sizes to permit handling of exhaust volumes up to 50,000 cfm.

Plus Other "Arrangement" Improvements Designed to Reduce Maintenance, Prolong Life, Cut Cost

ARRANGEMENT B (Manual Sludge Removal)

- Sloping sides for easier, faster manual clean-out.
- Lower section designed for ready conversion from manual to automatic sludge removal.

ARRANGEMENT C (Continuous Sludge Disposal)

- Heavier sludge ejector chain with longer chain pitch and slower speed—designed for longer life of all sludge ejector parts.

ARRANGEMENT D (Continuous Sluicing)

- New drain control equipped with regulating orifice; built-in flushing connection and lubricated plug valve.
- New water-supply control, complete with pressure regulator, which automatically assures constant water supply.

If your problem involves the collection of magnesium dust, the polishing, buffing or abrasive cleaning of all metals, write for Bulletin 277.

American Air Filter
COMPANY, INC.
312 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Typical Heat-Treatments for Carburizing Grades of Alloy Steels

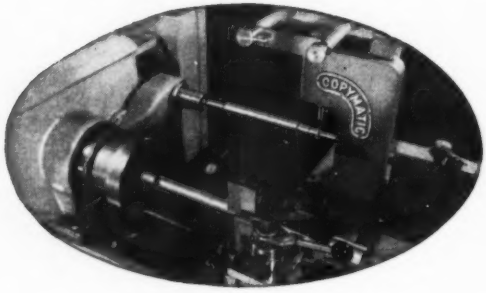
SAE Steels	ALTERNATE PRE-TREATMENTS: Normalize*	ALTERNATE PRE-TREATMENTS: Normalize & Temper**	CYCLE ANNEAL†	CARBURIZING TEMPERATURE, F	COOLING METHOD	REHEAT TEMP., F	COOLING MEDIUM	TEMPERING†† TEMPERATURE, F
1320	Yes	—	—	1650-1700	Quench in oil	1400-1450‡	Oil	250-350
	Yes	—	—	1650-1700	Quench in oil	1475-1525‡‡	Oil	250-350
	Yes	—	—	1650-1700	Cool slowly	1400-1450‡	Oil	250-350
	Yes	—	—	1650-1700	Cool slowly	1500-1550‡‡	Oil	250-350
	Yes	—	—	1650-1700	Quench in oil§	—	—	250-350
	Yes	—	—	1500-1650¶	Quench in oil	—	—	250-350
2317	Yes	—	Yes	1650-1700	Quench in oil	1375-1425‡	Oil	250-350
	Yes	—	Yes	1650-1700	Quench in oil	1450-1500‡‡	Oil	250-350
	Yes	—	Yes	1650-1700	Cool slowly	1375-1425‡	Oil	250-350
	Yes	—	Yes	1650-1700	Cool slowly	1475-1525‡‡	Oil	250-350
	Yes	—	Yes	1650-1700	Quench in oil§	—	—	250-350
	Yes	—	Yes	1450-1650¶	Quench in oil	—	—	250-350
2512, 2515, 2517	—	Yes	—	1650-1700	Cool slowly	1325-1375‡	Oil	250-350
	—	Yes	—	1650-1700	Cool slowly	1425-1475‡‡	Oil	250-350
3115, 3120	Yes	—	—	1650-1700	Quench in oil	1400-1450‡	Oil	250-350
	Yes	—	—	1650-1700	Quench in oil	1475-1525‡‡	Oil	250-350
	Yes	—	—	1650-1700	Cool slowly	1400-1450‡	Oil	250-350
	Yes	—	—	1650-1700	Cool slowly	1500-1550‡‡	Oil	250-350
	Yes	—	—	1650-1700	Quench in oil§	—	—	250-350
	Yes	—	—	1500-1650	Quench in oil¶	—	—	250-350
3310, 3316	—	Yes	—	1650-1700	Quench in oil	1400-1450‡	Oil	250-350
	—	Yes	—	1650-1700	Cool slowly	1475-1500‡‡	Oil	250-350
4017, 4023, 4024, 4027, 4028, 4032	Yes	—	Yes	1650-1700	Quench in oil§	—	—	250-350
4119, 4125	Yes	—	—	1650-1700	Quench in oil§	—	—	250-350

continued on next page

BLUE BOOK'S Know How Reference Sheets

full course or short orders

WITH A LODGE & SHIPLEY COPYMATIC



What's on your lathe work "menu"?

"Short order" limited runs, 5 or 25 pieces?

"Full course" turning production, 500 or more pieces?

Or both? Here's the lathe that satisfies any production "appetite."

For example, Leland Electric Co., Division of American Machine & Foundry Co., finds the COPYMATIC "the answer to short order lathe turning ... saves 8 hours per day ... 1 man's salary per year!"

Write for case histories and NEW descriptive Bulletin No. 216.

THE

Lodge & Shipley

COMPANY

3055 Colerain Avenue
Cincinnati 25, Ohio

4317 4320 4608 4615 4617 4620 X4620 4621	Yes Yes Yes Yes Yes Yes	—	Yes	1650-1700	Quench in oil	1425-1475‡	Oil	250-350
	Yes	—	Yes	1650-1700	Quench in oil	1475-1525‡‡	Oil	250-350
	Yes	—	Yes	1650-1700	Cool slowly	1425-1475‡	Oil	250-350
	Yes	—	Yes	1650-1700	Cool slowly	1475-1525‡‡	Oil	250-350
	Yes	—	Yes	1650-1700	Quench in oil§	—	—	250-350
	Yes	—	—	1500-1650¶	Quench in oil	—	—	250-350
4812 4815 4817 4820	—	Yes	Yes	1650-1700	Quench in oil	1375-1425‡	Oil	250-350
	—	Yes	Yes	1650-1700	Quench in oil	1450-1500‡‡	Oil	250-350
	—	Yes	Yes	1650-1700	Cool slowly	1375-1425‡	Oil	250-350
	—	Yes	Yes	1650-1700	Cool slowly	1450-1500‡‡	Oil	250-350
	—	—	—	1650-1700	Quench in oil§	—	—	250-350
5115 5120	Yes Yes Yes Yes Yes	—	—	1650-1700	Quench in oil	1425-1475‡	Oil	250-350
		—	—	1650-1700	Quench in oil	1500-1550‡‡	Oil	250-350
		—	—	1650-1700	Cool slowly	1425-1475‡	Oil	250-350
		—	—	1650-1700	Cool slowly	1500-1550‡‡	Oil	250-350
		—	—	1500-1650¶	Quench in oil	—	—	250-350
8615 8617 8620 8622 8625 8720	Yes Yes Yes Yes Yes Yes	—	Yes	1650-1700	Quench in oil	1475-1525‡	Oil	250-350
		—	Yes	1650-1700	Quench in oil	1525-1575‡‡	Oil	250-350
		—	Yes	1650-1700	Cool slowly	1475-1525‡	Oil	250-350
		—	Yes	1650-1700	Cool slowly	1525-1575‡‡	Oil	250-350
		—	Yes	1650-1700	Quench in oil§	—	—	250-350
		—	Yes	1500-1650¶	Quench in oil	—	—	250-350
9310 9315 9317	—	Yes	—	1650-1700	Quench in oil	1400-1450‡	Oil	250-350
	—	Yes	—	1650-1700	Cool slowly	1500-1325	Oil	250-350

* Normalizing temperatures should be not less than 50 F higher than the carburizing temperature followed by aircooling.

** After normalizing, reheat to temperature of 1000 to 1200 F and hold approximately 4 hr.

‡ Where cycle annealing is desired, heat to normalizing temperature, hold for uniformity, cool rapidly to 1000-1250 F. Hold 1 to 3 hr., then aircool or furnace cool to obtain a structure suitable for machining and finish.

‡‡ Tempering treatment is optional. Tempering is generally employed for partial stress relief and improved resistance to cracking from grinding operations. Temperatures higher than those shown are used in some instances where application requires.

‡ This treatment is applicable when case hardness only is paramount.

‡‡ This treatment is applicable when higher core hardness is desired.

§ This treatment is applicable to fine-grained steels only. When fine-grained steels are employed, a second reheat is often unnecessary.

¶ This treatment is for activated or cyanide baths, and parts may be given refining heats as indicated for other heat-treating processes.

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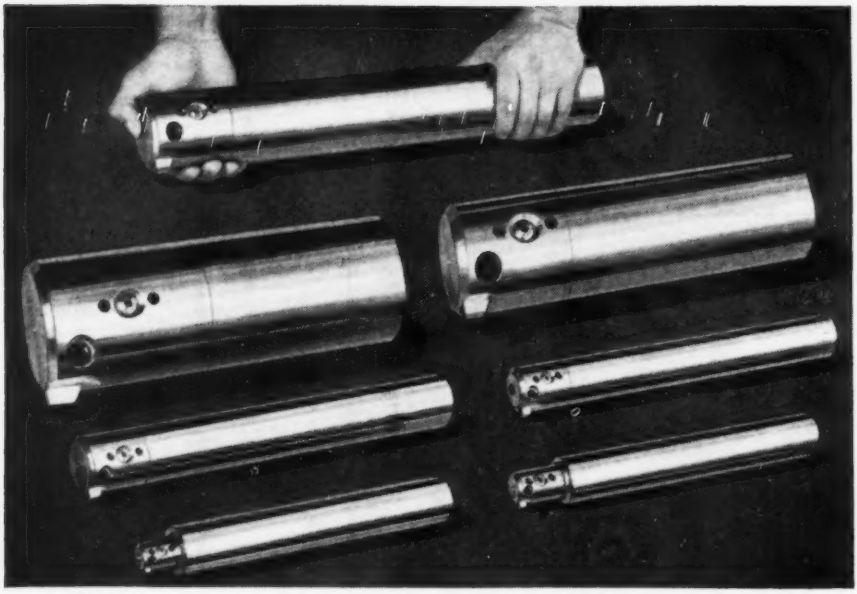
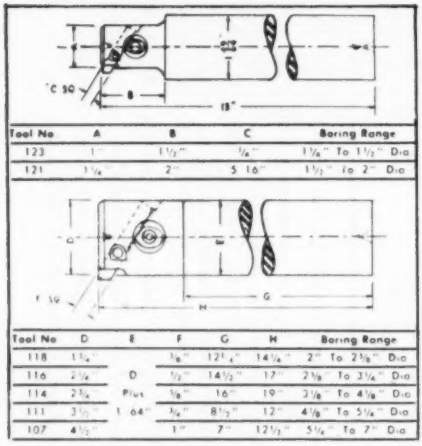


Why wait for delivery on precision boring tools?



Tool No	A	B	C	Boring Range
123	1"	1½"	¼"	1¼" To 1½" Dia
121	1¾"	2"	5/16"	1½" To 2" Dia

Tool No	D	E	F	G	H	Boring Range
118	1¾"		1/8"	12¼"	14¼"	2" To 2⅜" Dia
116	2¼"	D	½"	14½"	17"	2⅜" To 3¼" Dia
114	2¾"	Plus	⅝"	16"	19"	3⅛" To 4⅛" Dia
111	3½"	1.64"	¾"	8½"	12"	4⅛" To 5¼" Dia
107	4½"		1"	7"	12½"	5¼" To 7" Dia

Get immediate delivery of Davis stub boring tools with unfinished shanks and finish them in your own shop

It's fast. It's inexpensive. It's practical. In hours your order is shipped from stock. Without costly delays, you have high precision boring tools for any job requiring 1¼ to 7 in. bore diameter.

Properly centered and prepared for turning, Davis tools are designed for use with high speed steel, super high speed steel, or tungsten carbide tipped cutters. They are the same high quality tools — heat-treated 4150 alloy steel Rockwell "C" 28.32 — as Davis finished shank tools.

For details see your Davis representative or write for Bulletin DB-110.

If Davis can't bore it — it can't be done

DAVIS BORING TOOL DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

Typical Heat Treatments for Directly Hardenable Grades of Alloy Steels

SAE Steels	NORMALIZING TEMPERATURE, F		ANNEALING TEMPERATURE, F	HARDENING TEMPERATURE, F	QUENCHING MEDIUM	TEMPER
1330	— 1600-1700	— and/or	— 1500-1600	1525-1575 1525-1575	Water or oil Water or oil	To desired hardness To desired hardness
1335 1340	— 1600-1700	— and/or	— 1500-1600	1500-1550 1525-1575	Oil Oil	To desired hardness To desired hardness
2330	— 1600-1700	— and/or	— 1400-1500	1450-1500 1450-1500	Oil Oil	To desired hardness To desired hardness
2340 2345	— 1600-1700	— and/or	— 1400-1500	1425-1475 1425-1475	Oil Oil	To desired hardness To desired hardness
3130	1600-1700	—	—	1500-1550	Water or oil	To desired hardness
3135 3140 3141	— 1600-1700	— and/or	— 1450-1550	1500-1550 1500-1550	Oil Oil	To desired hardness To desired hardness
3145 3150	— 1600-1700	— and/or	— 1400-1500	1500-1550 1500-1550	Oil Oil	To desired hardness To desired hardness
4037 4042	— —	— —	1525-1575 1525-1575	1500-1575 1500-1575	Oil Oil	Gears 350-450 F To desired hardness
4047 4053	—	—	1450-1550	1500-1575	Oil	To desired hardness
4063 4068	—	—	1450-1550	1475-1550	Oil	To desired hardness
4130	1600-1700	and/or	1450-1550	1600-1650	Water or oil	To desired hardness
4137 4140	1600-1700	and/or	1450-1550	1550-1600	Oil	To desired hardness
4145 4150	1600-1700	and/or	1450-1550	1500-1600	Oil	To desired hardness
4340	1600-1700	and temper	1100-1225	1475-1525	Oil	To desired hardness
4640	1600-1700 1600-1700	and/or and/or	1450-1550 1450-1500	1450-1500 1450-1500	Oil Oil	To desired hardness Gears 350-450 F
5045 5046	1600-1700	and/or	1450-1550	1475-1500	Oil	250-300 F
5130 5132	1650-1750 1650-1750	and/or and/or	1450-1550 1450-1550	1500-1550 1500-1550	Water or caustic solution Water, caustic solution, or oil	To desired hardness To desired hardness
5135 5140 5145	1650-1750 1650-1750	and/or and/or	1450-1550 1450-1550	1500-1550 1500-1550	Oil Oil	To desired hardness Gears 350-400 F
5147 5150 5152	1650-1750 1650-1750	and/or and/or	1450-1550 1450-1550	1475-1550 1475-1550	Oil Oil	To desired hardness Gears 350-400 F
50100 51100 52100	— —	— —	1350-1450 1350-1450	1425-1475 1500-1600	Water Oil	To desired hardness To desired hardness

Courtesy: Society of Automotive Engineers, SAE Handbook, 1952 ed.

continued on next page

BLUE BOOK'S Know How Reference Sheets

ARTER *Precision*

ROTARY SURFACE GRINDERS
for Jet and Piston Engine Airplane Parts

THE MODEL "A"

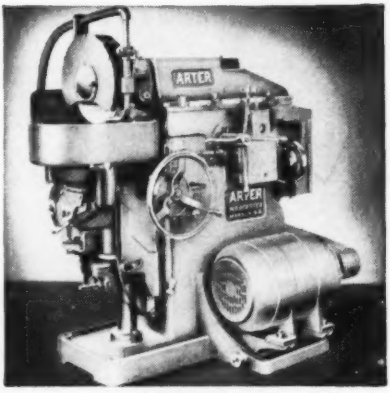
Model "A". Grinding is done on the periphery of the wheel, the work being held by a rotating magnetic chuck. Two sizes: 8" and 12" diameter.

THE MODEL "B"

Model "B". Four chuck capacities — 20", 24", 30" and 40". These machines are mainly hydraulically operated. Great vertical capacity. Work table can be tilted.

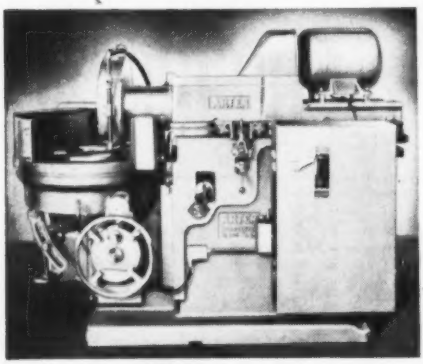
THE MODEL "D"

Model "D" — two chuck capacities — 12" and 16". A 7½ h. p. motor, precision balanced, mounted on the wheel slide delivers full power by multiple vee belts, to the wheel spindle.

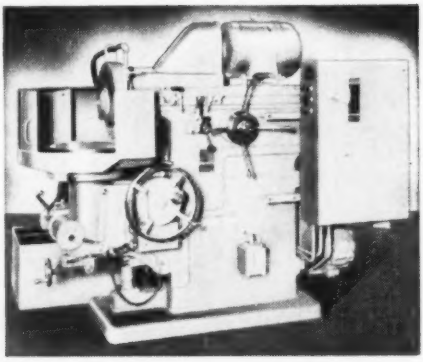


MODEL "A"

MODEL "B"



MODEL "D"



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SAE Steels	NORMALIZING TEMP., F.		ANNEALING TEMP., F.	HARDENING TEMP., F.	QUENCHING MEDIUM	TEMPER
6150	1650-1750	and/or	1550-1650	1600-1650	Oil	To desired hardness
9254, 9255, 9260, 9261, 9262	—	—	—	1500-1650	Oil	To desired hardness
8627, 8630, 8632	1600-1700	and/or	1450-1550	1550-1650	Water or Oil	To desired hardness
8635, 8637, 8640, 8641	1600-1700	and/or	1450-1550	1525-1575	Oil	To desired hardness
8642, 8645, 8647, 8650, 8653	1600-1700	and/or	1450-1550	1500-1550	Oil	To desired hardness
8655, 8660	1650-1750	and/or	1450-1550	1475-1550	Oil	To desired hardness
8735, 8740	1600-1700	and/or	1450-1550	1525-1575	Oil	To desired hardness
8745, 8750	1600-1700	and/or	1450-1550	1500-1550	Oil	To desired hardness
9437, 9440	1600-1700	and/or	1450-1550	1550-1600	Oil	To desired hardness
9442, 9445, 9747	1600-1700	and/or	1450-1550	1500-1600	Oil	To desired hardness
9840	1600-1700	and or	1450-1550	1500-1550	Oil	To desired hardness
9845, 9850	1600-1700	and/or	1450-1550	1500-1550	Oil	To desired hardness

Courtesy: Society of Automotive Engineers, SAE Handbook, 1952 ed.

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A Standard Machine Designed for Variety Production

Why build a special machine for drilling radial holes when the above illustrated standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!

Any number of drilling units up to eight may be employed, the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32" to 3/8" on drilling operations and O-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

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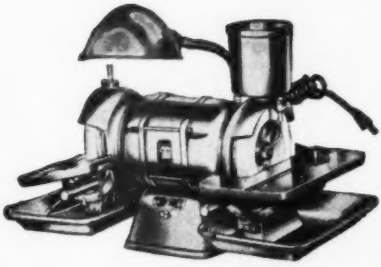
Automatic **DRILLING UNIT**

Baldor BALL-BEARING GRINDERS



Clip this ad and mail for bulletins on Carbide Tool Grinder.

CARBIDE TOOL GRINDER FOR PRECISION WORK

The ½ hp motor that powers this Baldor Carbide tool Grinder has no commutator, no centrifugal switch, no brushes—a really trouble-free motor that will not burn out even when overloaded repeatedly. Electronically balanced within 1/50 ounce of perfection, the armature rotates at 3450 RPM without vibration—an engineering achievement that makes true precision work possible. Complete price as shown. **$149.20**

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Baldor is a basic manufacturer of Grinders - even the motors are built by Baldor. The new streamlined grinder, 8200 series, is excellent for grinding long and odd-shaped pieces as there's plenty of clearance between the wheels and the motor frame. ½ hp, 3450 RPM, capacitor-start, capacitor-run motor GUARANTEED 2 years against burnout. Baldor makes a complete line of 6"-12" general purpose bench and pedestal grinders. Complete price as shown. **$89.50**

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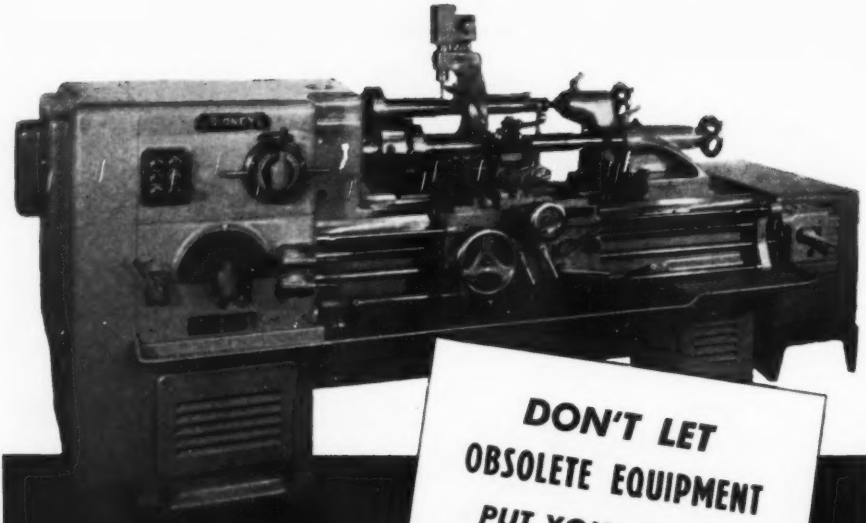

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Foremanship Forum

How Your Foremen Can Make the Most of Your Conference Meetings

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

FOREMEN and supervisors generally fall into two groups as regards their effective participation in conferences and meetings: they are relatively inarticulate, not contributing much to the discussion; or, they are overly-talkative, monopolizing the discussion and forcing it along the lines of some pet peeve or problem of their own. The man who makes an effective contribution to a meeting and who also goes away from the session with a practical idea he can use, is relatively rare.

There is a logical reason for this, related to the historic failure of management to differentiate between managerial skills and job skills. It is still common practice for a loyal employee who has a good production record to be moved up as lead-man and foreman, yet is without a clear understanding either of the executive responsibilities of his new task or of his ability to discharge them. Studies made in recent years comparing the abilities of supervisors and union officials indicate that on the whole, the elected union officials have higher mathematical and reading ability, and a far greater command of language and ability to express themselves than the average foreman. They compete in ability, in many cases, with top-level management men in this respect.

Foremen's meetings, whether of direct practical content or of a more long-run training content, are to some extent an attempt by management to upgrade the effectiveness of the line supervision. However, if these men cannot participate effectively in the meetings, regardless of how well the sessions are planned, much of this effort is wasted.

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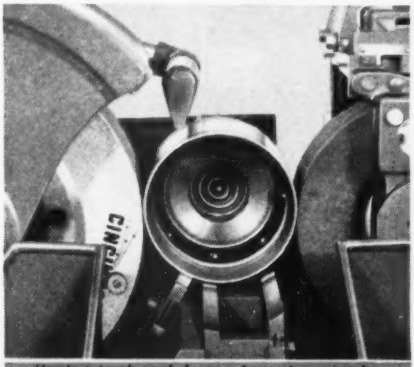
CINCINNATI Grinding Wheels are made to team-up with centerless grinders for the smartest solutions to industry's toughest grinding problems. And with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer–FAST!*

CINCINNATI Grinding Wheels are used by–and *developed* by–Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

CINCINNATI Grinding Wheels have solved hundreds of centerless grinding problems involving finish, roundness, taper, sizing and production.

2 Using CINCINNATI Wheels, we've solved hundreds of centerless grinding problems—such as finish, roundness, taper, sizing and production.

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.



Here's a tough one! Large volume of metal to be removed, involving high heat, while holding close tolerances on a large part easily distorted by pressure. (See Case History at right.)

We are so sure that CINCINNATI Grinding Wheels can help solve your tough centerless grinding problem that we make this *unconditional offer*—either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

CASE HISTORY No. 637

New CINCINNATI Grinding Wheels Solved Tough Grinding Problem

The job	Diesel Engine Piston, 8¼" Dia. x 9" long x 3/16" wall, alloy cast iron, 217-302 Brinell. Stock removal .010-.015". Tolerance - straight and round .002", finish 20-50 RMS. To be ground in one pass.
The machine	Cincinnati No. 3 Centerless (altered).
The problem	Close tolerances to be held on a large part that is easily distorted by pressure. Large volume of metal to be removed (about 1½ cu. in.) involving high heat.
The solution	Close collaboration between production men, machine tool men and grinding wheel men resulted in a notable solution to a difficult job. Tolerances are successfully held. Grinding time, under shop conditions, is 1.1 minutes per piston. Six pistons are ground between dressings. The wheel is a Cincinnati 4A46-I5-VX, regular aluminum oxide instead of the more conventional silicon carbide. It not only costs less but reduces diamond wear which is important, considering the width of the wheel (10") and the close tolerance for taper.

If you have a tough centerless grinding problem, contact us at once. We'll send one of our expert machinists—men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless grinding problem. There is no charge for his service. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

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The supervisors, themselves, are often aware of this, and their inability to take part in the sessions brings on a frequent reaction in the form of distaste for these sessions as a waste of time.

A few tips, then, might well be in order for the foremen and supervisors who attend these meetings, as to how they might improve their effectiveness in discussion, how they might get more out of the meetings and make a more effective personal contribution to them.

1. **Be Purposeful.** It is difficult, perhaps, for the foreman to feel any purpose in attending a meeting other than compliance with either a request or an order from his boss. Yet, if the foreman knows in advance the subject of the meeting, he can see a personal reason for attending it if the subject related to his own job or problems. He can even have a specific purpose in attend-

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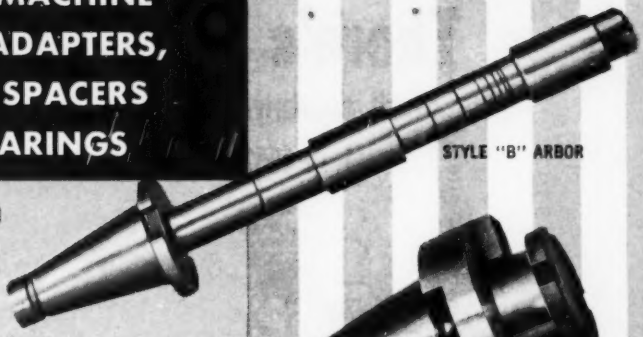

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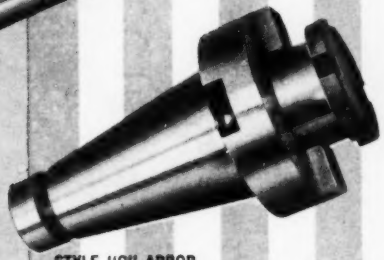
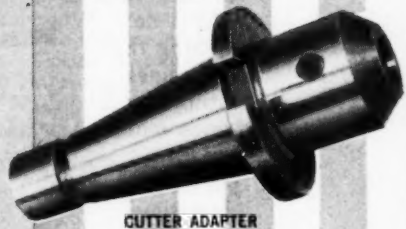


STYLE "C" ARBOR



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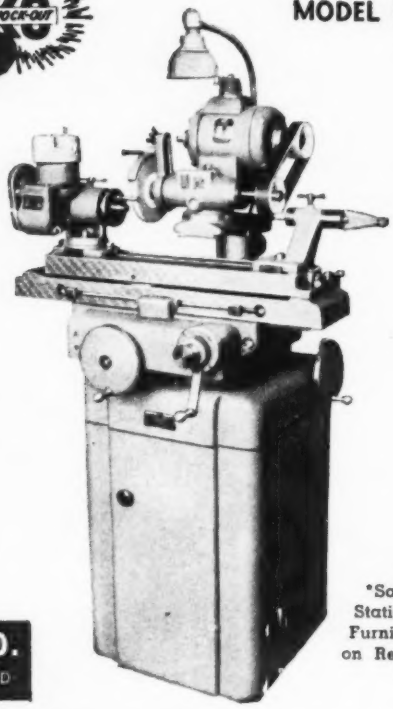

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ing the session in terms of a specific contribution he wants to make to that meeting . . . IF, he will think over the problem to be considered and **make a decision** as to what he thinks should be done. This decision, and the passing-on of this decision to the other group members, becomes his personal purpose in attending.

2. **Be Prepared.** With the press of daily activities, it is hard for the typical supervisor to take time to prepare himself specifically before attending a meeting. However, if the session, for example, is devoted to a possible shop housekeeping contest, it takes only a few moments to run a fast survey of his own department, note what conditions exist, and obtain some inkling as to the possible reactions of his men to such a proposal. Armed with this information, the supervisor is in position to make

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some decision in advance of the meeting as to his own attitude towards the problem and back it up with facts. He knows what he is talking about!

Further, this business of being personally prepared before taking part in a meeting also involves establishing a certain outlook. In a session, trying to get the feeling that you are not debating against individuals, rather you are considering their ideas and facts. By removing the element of personal opposition, and concentrating on facts and arguments, the other people in the meeting quickly get the feeling that this is a mutual discussion of mutual problems rather than a dogfight in which one or more people are simply trying to assert their superiority or importance.

3. **Be Relevant.** During discussion, try to stick to the point. In any free discussion meeting, it is entirely too frequent an occurance that the meeting

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starts out talking about one problem and winds up two hours later having discussed three other things without ever reaching any conclusions on the primary subject or the others either.

The basic considerations to keep in mind in discussion of any shop problem in a conference are: is there any NEED for a change from present conditions or methods? What is the cause or the underlying REASON for the present situation? What is the best specific PLAN which will provide some solution to the problem? Will it WORK? What will be the RESULTS, in terms of production, economies, costs, etc.?

Thus, to be relevant in group discussion, ask yourself: "Do I understand the point being discussed? What are the issues here? Does what I have to say bear upon the specific issue?" Then make your contribution, knowing that

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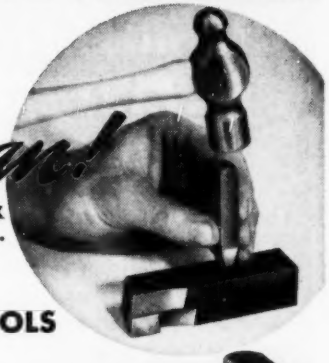

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it will be useful and will help carry the discussion towards a successful and useful conclusion.

4. **Be Brief.** Being brief in discussion is not only courteous, it is also an efficient way of getting your points across. It is fairly easy for the first person to talk about a subject to talk all around it, go into various aspects of it, and more or less exhaust it and his listeners. However, as the discussion gets going, different people in the group will have something to say on more or less unrelated points. A proposal has been advanced. One man says we don't need it. Another say it will cost too much. Another says the men in his department will like it but probably won't know what to do about it. Another thinks it would be a good idea if the proposal

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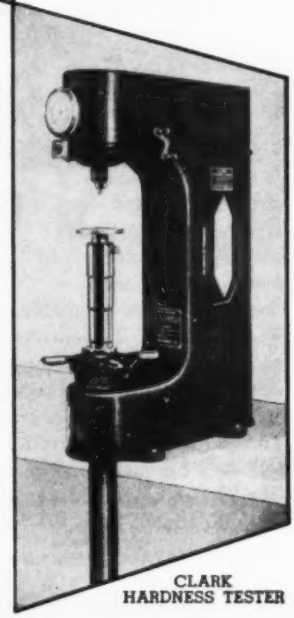

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were only changed around according to his ideas. From all this a good deal of confusion can easily result.

If, however, you are brief in what you say, not only sticking to the point and knowing what you are talking about, but confining yourself in a single short talk to a single idea, then tendency will be for the discussion to stay on the track and consider one thing at a time so that definite progress is made in the group towards reaching a useful conclusion.

You can always say something again a few moments later on, on the other ideas you have in mind, without confusing the group at present by trying to say too much about too many aspects of the problem. When you make your points, state the issue you are discussing; present the facts and arguments which support your present specific thought; ask the group to agree with you on that point while showing them how such agreement will work to their specific benefit.

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5. **Be Orderly**. Being orderly in group discussion is more than being courteous or polite. Foremen and supervisors have time and again participated in meetings which went on and on and arrived nowhere. Confusion and disorderliness bogged-down the whole affair. Was it not Von Moltke who said "Anything which can be misunderstood will be misunderstood?" If there is any chance of a meeting becoming disorderly, it will surely happen.

Parliamentary law was originally developed as a set of rules for the orderly conduct of meetings which were attempting to arrive at group decisions. Its purpose was to protect the rights of all to have their "say" in the meeting and to insure that the decisions were reached in a lawful manner.

Foremen and supervisor conferences are usually conducted on a very informal plane where no such rules of procedure are necessary. However, it has

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been found that efficient meetings are possible only when a few "ground rules" are in force and are observed. Group members in most discussions need to be reasonable calm, tactful in presenting their views and in disagreeing with other members, courteous in their comments. They must remember that they are discussing a problem, not personalities, and that the fellow with a silly idea and inadequate information is very likely just as sincere as they in trying to help the group arrive at a good conclusion on the problem.

The other people in the room must have a chance to talk. No one person should monopolize the conversation. As Josh Billings says: "A man is a bore when he talks so much about himself that I can't talk about myself." He is worse than a bore when he takes up all the discussion time with his own ideas and doesn't give the other people a chance. Of course, a large part of the

responsibility for avoiding this rests with the chairman or discussion leader, but each group members has his own responsibility to keep his own remarks brief and to the point to create adequate opportunities for an **exchange of ideas.**

Finally, in being orderly, be sure to follow the ground-rules of the group. If it is customary for the group leader to open the discussion and then go around the group getting response from each person until each has had a chance to comment, try letting the discussion follow this accepted pattern without butting in too far ahead of your turn and creating the feeling among some members that they are being "squeezed out."

In brief, foremen and supervisors who want to participate effectively in conferences and group meetings should attend these sessions with a specific purpose in mind; the need to come prepared to talk, knowing what they are talking about; arguments and comments should be relevant, to the point; if possible, comments should be brief to keep the discussion moving and on the track; and, finally, following local ground rules for discussion helps in maintaining an orderly discussion which reaches conclusions about the group problem which the foreman and supervisors can apply directly to their departmental problems.

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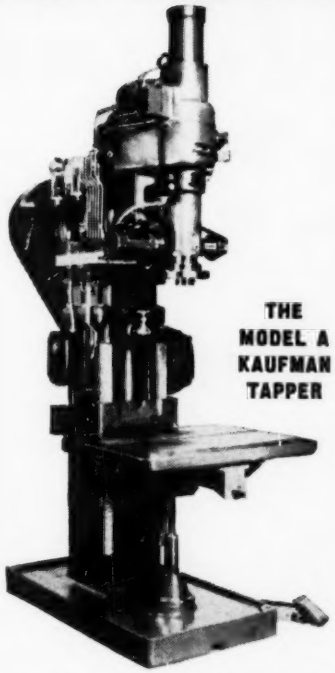

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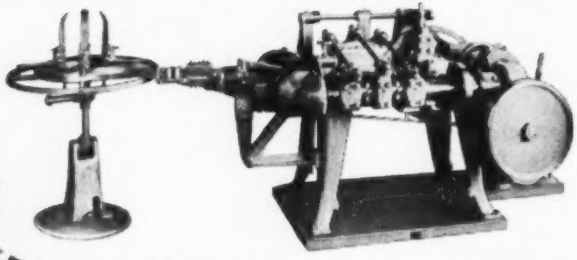

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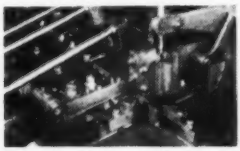
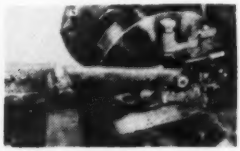


Close-up of the NILSON forming section with the built-in Horizontal Press to the left. This design eliminates secondary handling and insures product uniformity because the sequence of stamping and forming is automatically controlled.



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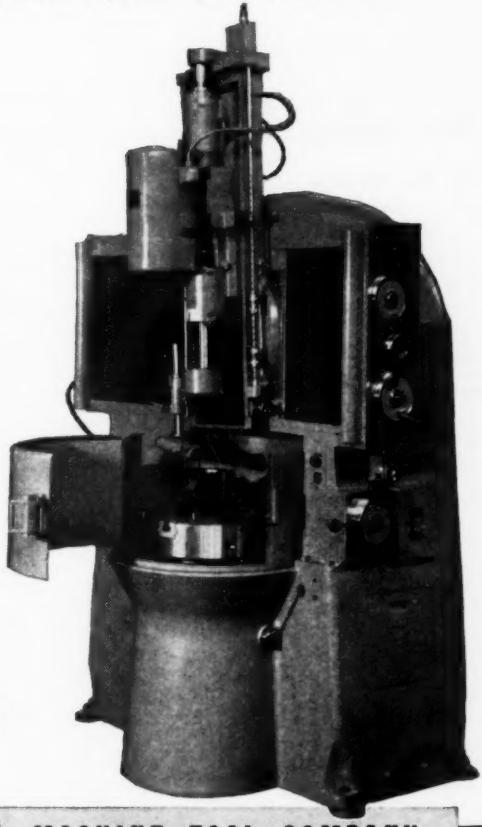

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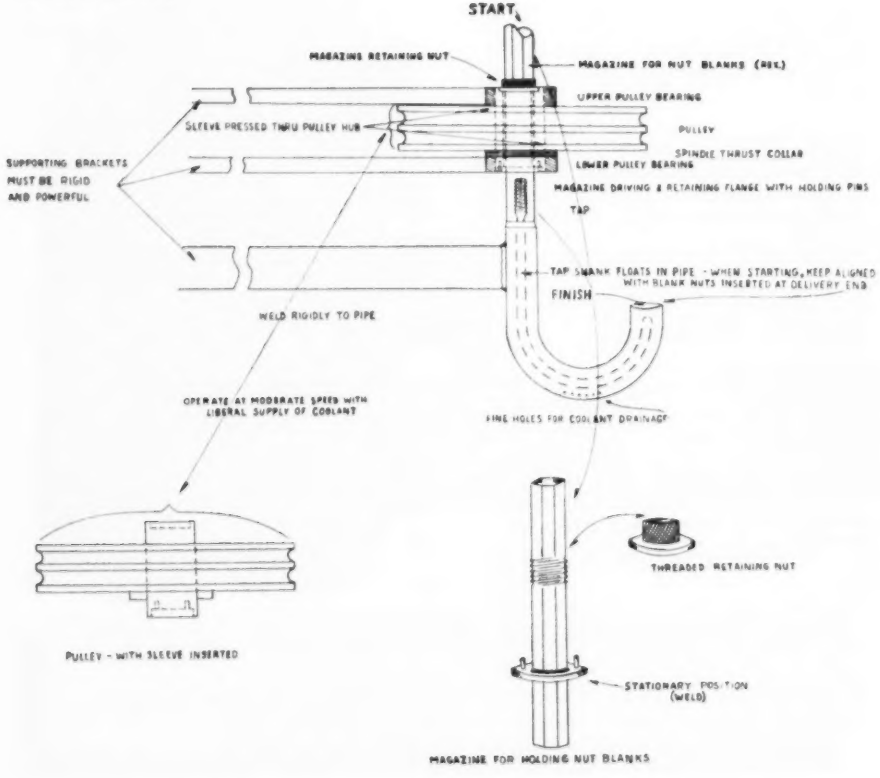
By **Geo. Burnley**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STATIONARY POSITION (WELD)
MAGAZINE FOR HOLDING NUT BLANKS

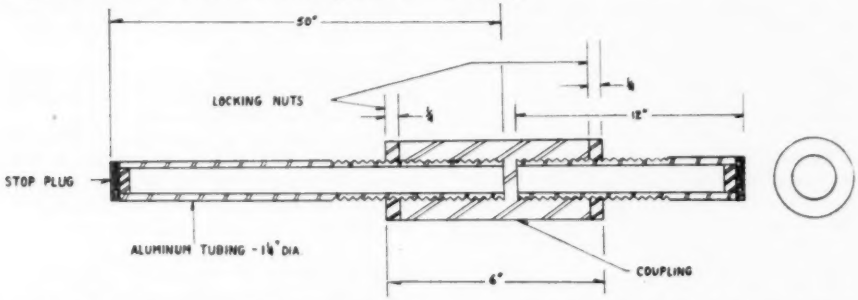
Easily made bar stock tail stop

by **Harold D. Rhodenbaugh**

In hand screw, bar stock machine work there frequently arises an occasion where a tail or spindlestop is a must. This is especially true when tubing or shafts have been cut to specified lengths and are followed by machining operations which call for close dimensions processed to the end of the bar or tube.

Under these conditions it is difficult and sometimes impossible to hold tolerances with a hexigon turret stop. This is especially true where over-all lengths have not been held.

Here is a spindle or stock stop, easy to make and easy to adjust for such emergencies on a No. 3 Warner & Swasey.

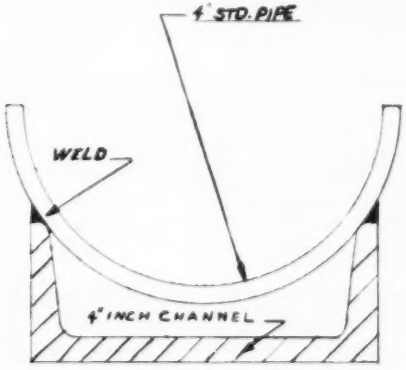


Lock the bar stock feed into relative position. Insert the "stop" through the bar stock feed into the spindle to the desired position, and lock it tight. Close adjustment can be made in setup with the locking nuts.

Handy welding rod holder

by **Roger Isetts**

Illustrated is a handy, easy to make holder that a welder can use for keeping welding rod close at hand. A length of 4" standard channel iron is turned legs upward. A piece of 4" iron pipe is cut in half and welded inside the channel as shown. After the pipe is cut in half all burrs and sharp edges should be filed off to prevent cutting the hands or tearing the clothes.



Master setup pieces

by **Harold D. Rhodenbaugh**

To reduce scrap and setup time, it is well to consider operational master setup pieces. This is especially true on hand screw machines where multiple phases of an operation are involved.

Considerable time is required to make a setup from scratch on a shaft having several diameters with accompanying shoulders, undercuts and faces, etc. The operator or jobsetter must cut and measure repeatedly. One miscalculation can produce a piece of scrap.

With a master setup piece to work from, the operator can set his tools to hold lengths of cuts and diameters with a .0015 feeler. It is much faster and resultant scrap is nil.

Master setup parts should be identi-

fied as such, and be located with the tool kit, or in tool crib location.

Steel setup parts should be case hardened to safeguard against careless operators who would damage the part with their cutting tools.

Die cleaning time shortened

Die cleaning has been shortened from an eight-hour-a-week undertaking to an easy 10-minute job at Temco Aircraft Corp., Dallas, Tex. Abrasives had been used by Temco employees to grind aluminum burrs, burned grease and paint off chromed die faces.

Grinding cleaned off the melted matter satisfactorily, though the system required a man-hour a day on the average; abrasives often did more damage to die configuration than the melted matter caused.

D. R. Gates, hot dimpler in Temco's A2D center wing department, after some research, developed this system:

Mix caustic soda and water at a cup-to-a-gallon ratio. Heat the mixture to 200 degrees fahrenheit in a glass or steel container on a hot plate. Drop dirty dies in the mixture, and two to ten minutes later, take them out. Rinse them in plain water and dry with a rag, and they look and work as good as new.

The inexpensive solution won't damage chrome, iron or steel, the metals of which dies are made. Dirty dies, in fact, may be soaked in the solution overnight, or indefinitely, without danger.

Magnesium is the only other metal Gates has found that is impervious to the eating action of caustic soda.

Gates uses an iron or steel basket to dip dies in and out of soda solution. He adds that anyone using his system should use care in handling the cleansing soda.

Assembling a tapered shank tool to a tapered hole

by **Henry A. Roy, Sr.**

When assembling a tapered shank tool such as a drill chuck (Fig. 1) or a tailstock center (Fig. 2) in a tapered

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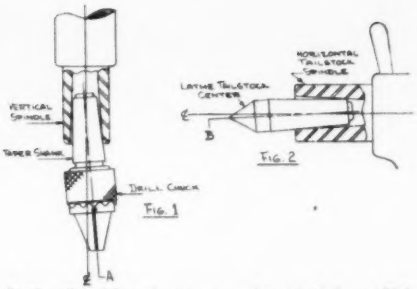


Fig. 1 Fig. 2

hole the idea is to put the tool in solid, otherwise it will slip and loosen when in operation.

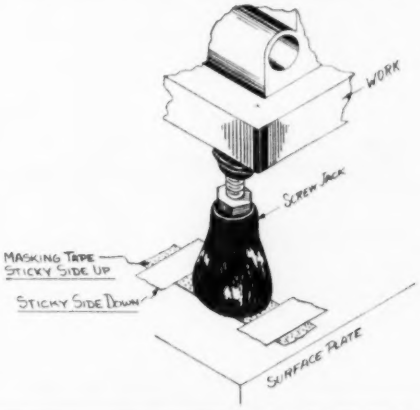
1. Enter the tool in the hole the full length very lightly.
2. Pull the tool out about ⅛".
3. Tip the tool so that the tool is hitting the i.d. of the tapered hole cross corner. See "A", Fig. 1, and "B", Fig. 2.
4. Push the tool inward rapidly—keeping it cross corner.
5. Now the tool is firmly gripped and will not loosen easily.

Stops jack slippage

by **Henry A. Roy, Sr.**

When adjusting a screw jack—if the casting that is setting on it is too light the jack will move when it is being adjusted.

To prevent the screw jack from mov-



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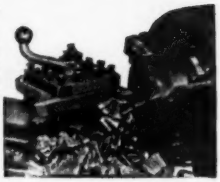
The same tool used for broadface turning merely by indexing turret 1 position or 30°



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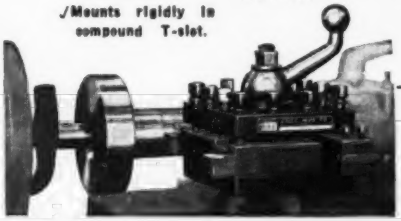
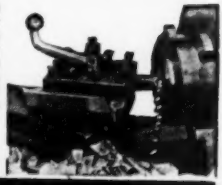


Same tool used for inside chamfer merely by indexing back 2 positions or 60



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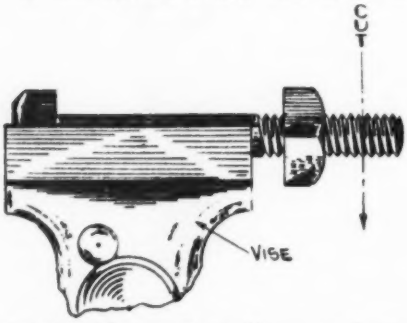
ing—just set the jack on a small strip of masking tape as shown in sketch. Now the screw jack will remain stationary while being adjusted.

Removing burrs from shortened bolts

by **Henry A. Roy, Sr.**

A nut left on a bolt that is to be

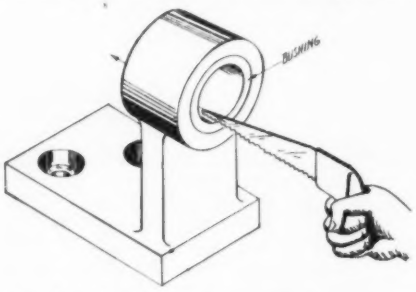


shortened by sawing will remove burrs from the end that was cut. Simply remove nut, and the burrs come with it, making excess filing unnecessary.

Removing a worn bushing or bearing easily

by **Henry A. Roy, Sr.**

In many cases a worn bushing or bearing can easily be removed by saw-



ing thru it with a close quarter saw as shown in sketch above.

Once the bushing or bearing is split it will collapse and will come out easily by one end with a rod and a hammer.

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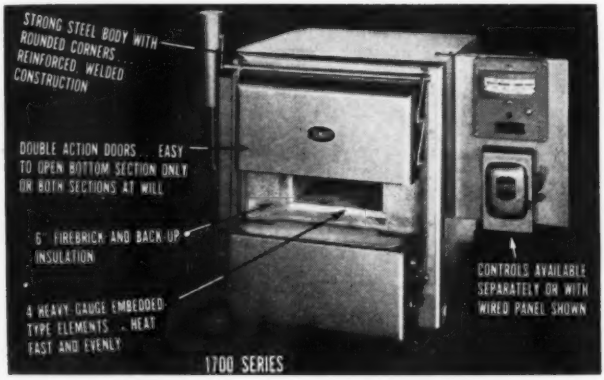
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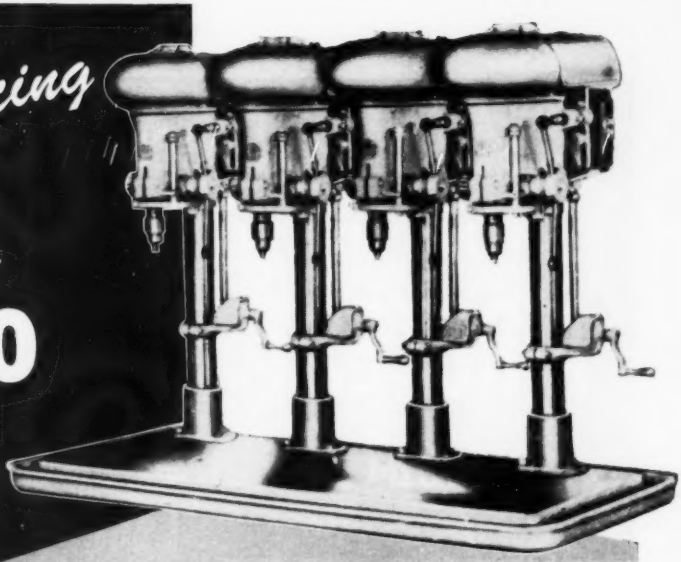

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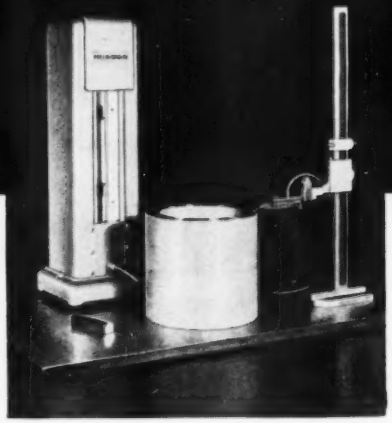

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A special report by the editors of MACHINE and TOOL BLUE BOOK

Report number 34

Grinding Machines . . . part 8

This is the thirty-fourth in a monthly series of special reports discussing various types of machine tools. Included in this month's special report on grinding machines are:

1. **Surface Grinding.**
2. **Descriptions of late model grinding machines.**
3. **Specifications of American-built machines.**

Previously published reports discussed: 1. Thread Rolling; 2. Power Press Brakes; 3, 4. 5. Milling Machines; 6. Honing, Lapping, and Superfinishing; 7. Automatic Screw Machines; 8. MAPI Replacement Formula; 9, 10. Chucking Machines, Turret Lathes, Hand Screw Machines; 11. Broaching Machines; 12. Shapers, Slotters, Keyseaters; 13, 14, 15. Lathes; 16. Planers; 17. Gear Making Machines; 18, 19. Boring Machines; 20, 21, 22, 23, 24, 25, 26. Drilling Machines; 27, 28, 29, 30, 31, 32, 33. Grinding Machines.

Surface Grinding

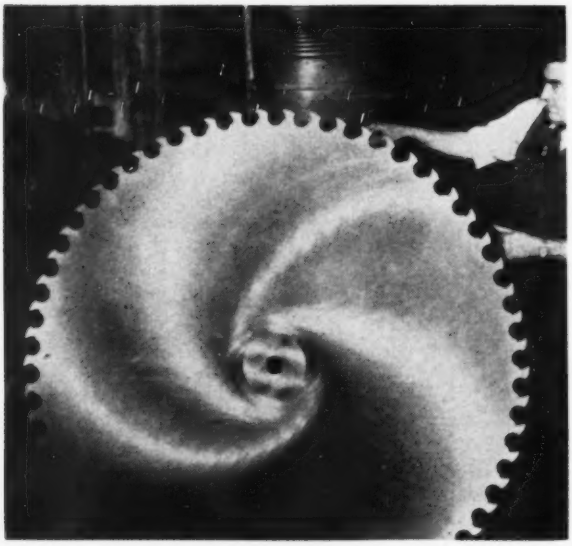
by **Albert I. Palm,** grinding engineer, The Norton Co.

WHEN ONE CONSIDERS that less than 70 years ago flat surfaces were generally evened up by the chisel or file, it can be readily seen that surface grinding has come a long way. Precision grinders of today, with their smooth hydraulic table traverse and high speed, are a far cry from earlier models of as late as 25 years ago.

Although the machines are quite easily operated, it still depends on the operator's judgment and understanding of grinding wheel behavior and his ability to quickly spot any kind of trouble and correct it that determines the worth of any grinding unit.

Machines used vary greatly; from small toolroom machines, mounting 7" diameter x ½" thick wheels, to massive face grinding machines, carrying 48", and even 60" diameter chucks securely holding abrasive segments.

More and more, the metal working industry is adopting the ground plane surface for reasons of economy and pro-



The type of work that can be handled on a vertical spindle, rotary table surface grinder is typified in this 60" circular saw. The sides are concaved for clearance.

ductivity, as well as from considerations of quality of surface finish, accuracy and appearance. Many parts formerly milled, planed, or hand scraped are now precision surface ground. Each year the trend in this direction becomes more pronounced. The wide variety of types of surface grinders and of sizes within each type now available testify to the importance industry attaches to this machine as a production tool.

Types of surface grinding machines

Surface grinding machines are divided into two types with respect to the movement of the work table:

1. Planer type in which the work table reciprocates; 2. Rotary type in which the work table revolves.

The planer and rotary types are further divided according to the type of wheel, as follows:

1. Planer type surface grinders, horizontal spindle: (a.) Using the periphery of straight wheels, such as Norton, Thompson, Mattison, Abrasive, Hill-Acme, Brown & Sharpe; (b.) Using the rim of cylinder wheels or segments such as Hanchett, Bridgeport, Rogers. **Vertical spindle:** (a.) Using the rim of cylinder wheels or segments such as Pratt & Whitney, Hanchett, Hill-Acme,

2. Rotary type surface grinders, horizontal spindle: Using the periphery of straight wheels, such as Heald and Arter; **vertical spindle,** using the rim of cylinder wheels or segments such as Blanchard and Hanchett.

When the rate of metal removal runs high, a great factor is the problem of chip disposal; this is a magnetic separator, one means of solving it.

"BEST BUY . . .
the boss ever made!"

LEACH 6 X 12 SURFACE GRINDER

HIGH OUTPUT
at LOW COST

Don't let the low price fool you! The Leach 6 x 12 Surface Grinder is an entirely new engineering triumph that does the BIG jobs. Easily and accurately handles 90% of the work of far more expensive machines. A proven giant money-saver by hundreds of enthusiastic owners. Completely self-contained . . . 2-speed ball bearing spindle, driven by a ¾ HP motor. Nowhere else can you get such high output at such low cost! Write for detailed description.

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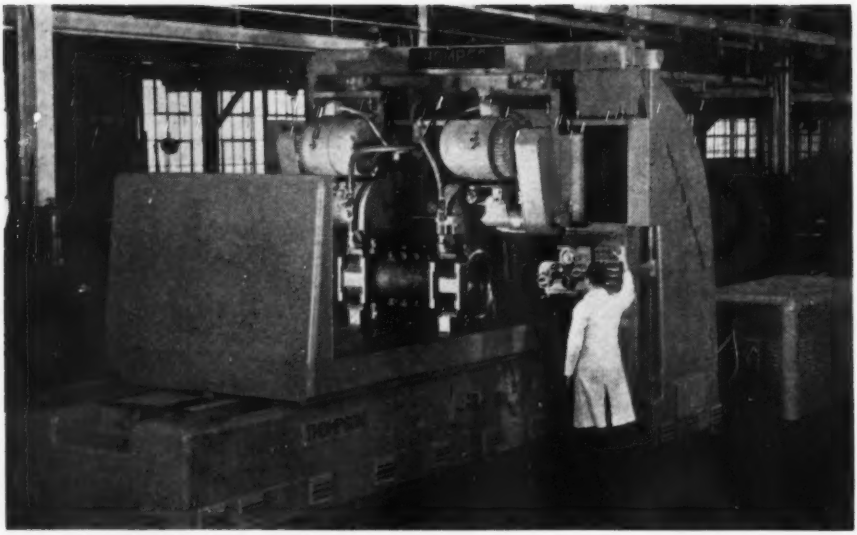


Hydrail machine 75 x 36 x 120 with dual wheel heads setup for grinding horn guide wear strips in anti-friction locomotive drive box.

General suggestions for surface grinding

Care of Machine. In order to produce the best results in surface grinding, it is essential that the precision built machine be properly cared for. Close attention should be paid to such important details as lubrication, particularly of the wheel spindle and table ways, condition of the magnetic chuck, the level and grade of oil in the hydraulic system, and even the matter of keeping the machine as clean as possible.

Wheel balance. Where a straight wheel is used, it is essential that the grinding wheel run perfectly true and without vibration to produce a chatter-free finish. On the larger machines, it is good practice to first rough true the wheel when newly mounted on its own sleeve, balance it carefully by means of the balancing weights provided in the wheel sleeve and then finish true it.

Design of parts to be ground. It is general practice to leave a fairly large amount of stock to be removed when planing or milling operations are to be

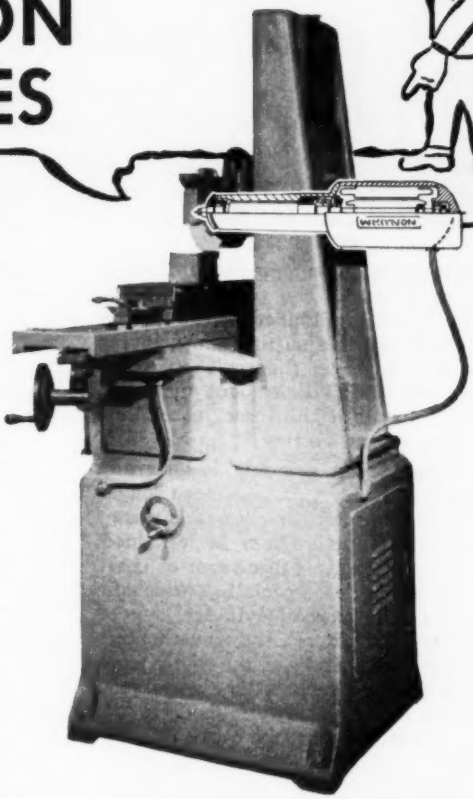
This is one type of rotary surface grinder.

Take the advise of one who knows!

When you replace your old Spindle or when you order a new Surface Grinder

specify

WHITNON SPINDLES



Heavily spring preloaded to keep spindle radially and axially rigid. — Stock Spindles are one full horse power, 3600 RPM enclosed motor, 220/440 volts, sealed in lubrication.

Sparks out fast leaving an excellent finish. — The only spindle rigid enough for crush dressing and perfect contour grinding.

Constant adjustment from spring preload keeps spindle rigid regardless of wear or temperature change.

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Inquiries regarding standard or special Spindles for grinding, milling, boring and drilling operations receive immediate attention.

Inquire today, specifying machine, volt age, frequency and phase.

THE WHITNON MANUFACTURING COMPANY

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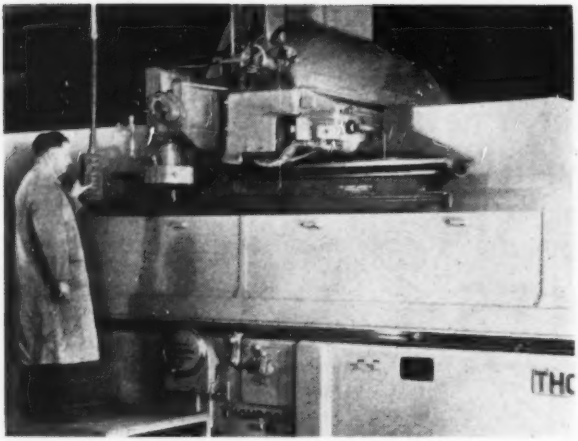

Heavy duty surface grinder with dual wheel heads for grinding both the flat and V-ways of lathe beds.

performed to allow for removal of scale and hard spots. The present trend is to eliminate preliminary machining wherever possible so that the grinding operation removes the scale and produces the desired dimensions and finish in one step. In this case, much less stock is left on casting.

Coolants. Wet grinding is generally preferred to dry grinding since longer wheel life, better finishes, and faster rates of production can be obtained. In wet grinding, a full stream of coolant is desirable, especially inside the wheel in the case of cylinder, cup or segment type wheels, since overheating can cause distortion of the work piece and magnetic chuck. It is always good practice also to use the outside nozzle to assist in keeping the work cool.

If the stream from inside the wheel becomes small, or stops completely when the outside nozzle is wide open, it of course indicates either too little coolant in the tank, or that the coolant piping system is clogged. The level in the tank should always be kept high and the settling tank cleaned out at frequent intervals to insure an ample supply of clean coolant at proper temperatures. The coolant filter is of the utmost importance and should be cleaned frequently so that sufficient coolant is provided. Grinding fluids prevent overheating of the wheel and the work and its lubricating and detergent properties help to keep the wheel face clean and free cutting.

For the general run of steels and cast iron, the most common grinding fluids are of the water-emulsion type and are generally used in a ratio of one part oil to 50 parts water. Metals which tend to load the wheel, such as aluminum and certain stainless steels, require high detergent oils to retard wheel loading.

Cylinders versus segments. To produce the best finishes on vertical spindle surface grinders, a cylinder type wheel is generally preferred to a segment type wheel. When using fine grit, soft grade cylinder wheels, finishes of 5 micro-inch r.m.s. and better can be obtained.

Either cylinder or segment wheels may be used, however, to produce ordinary commercial finishes, and the advantage of the segment type wheel, of course, is its cooler and faster cutting ability (as a result of its interrupted

SANFORD BENCH SURFACE GRINDER
MODEL SG

*for Wet*or Dry Grinding!*

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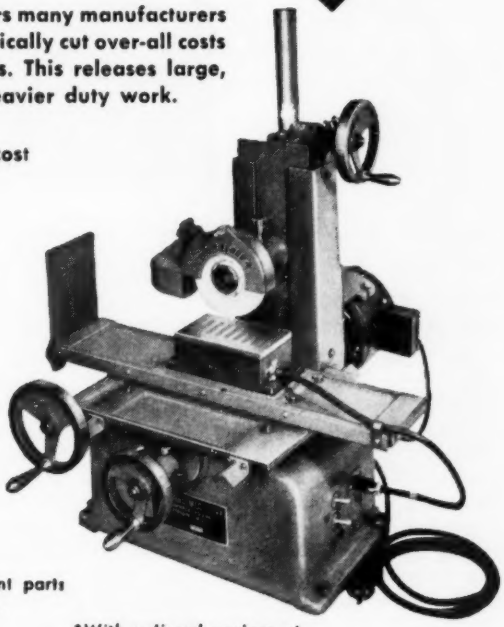
A *low cost*, precision machine for surface grinding dies, instrument parts, gauges and other small parts which would fit in the palm of the hand.

By using Sanford Bench Grinders many manufacturers of precision machinery have drastically cut over-all costs for finishing small intricate parts. This releases large, more expensive machines for heavier duty work.

The Sanford SG is the *only* low cost Bench Surface Grinder that

- **Grinds to less than .0001" tolerances**
- **Operates without vibration**
- **Assures long life because Meehanite castings are used in its construction**



SPECIFICATIONS—4" traverse —8" longitudinal—6" vertical under 4" wheel. Approximate weight 160 lbs.

Complete details are included in illustrated bulletin.
Send for your copy today.

Reconditioning facilities, replacement parts and special attachments are available.
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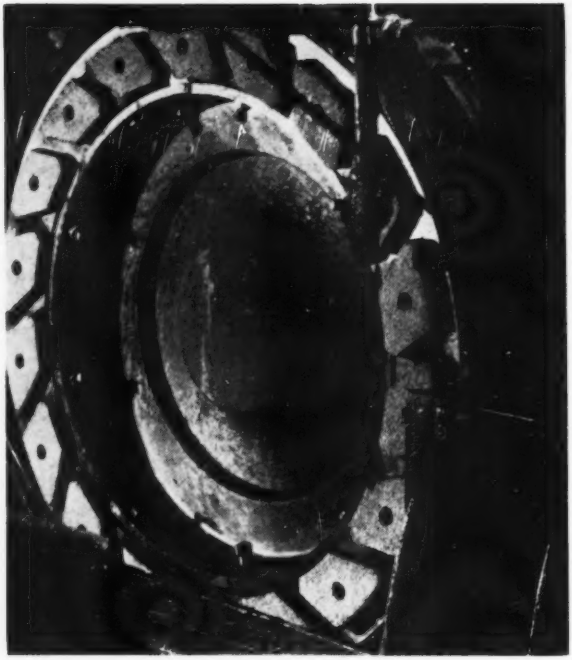


Face grinder with traveling table equipped with a 42" segmental grinding wheel.

grinding surface) with consequent lower overall grinding costs.

Surface grinding troubles and their remedies

Work not flat. A part having a comparatively thin section may spring slightly during grinding, causing more or less variation in flatness. The magnetic pull on thin work that is slightly warped may be sufficient to draw down the warp to be removed. Such work, if not too thin, often can be ground flat simply by placing it on the chuck without magnetizing it, but blocking it at both ends to prevent its sliding on the chuck.

Do not hurry the grinding. Take very light cuts on the finishing passes so as not to overheat and distort the work. Be sure the grinding wheel face is clean and sharp. Be sure the wheel is of the proper abrasive, grit size and grade for the material being ground and the finish required; then dress the wheel accurately to keep it sharp and cool cutting.

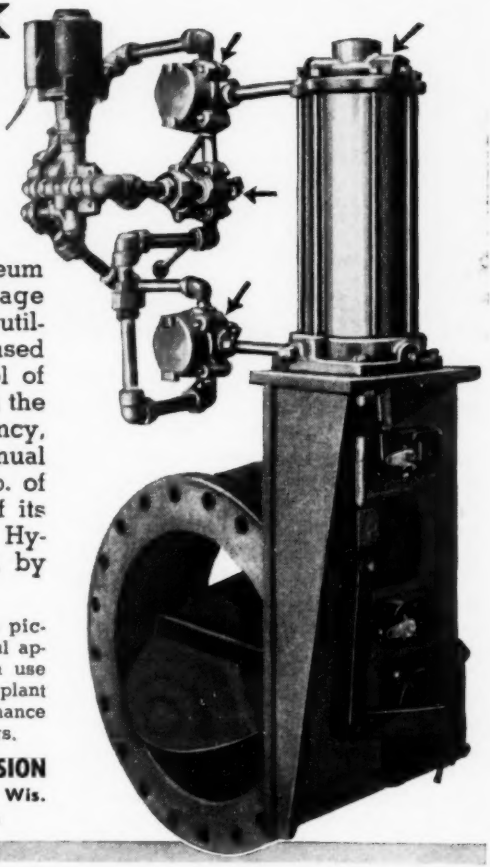
Be sure the material is as free as possible from any internal stresses before finish grinding. Work that has been heat treated should first be rough ground in order to relieve the internal stresses set up in the heat treatment. The rough grind may leave the work slightly distorted. The procedure then is to pack the work with paper strips, or shim stock, and grind one surface flat; then, finish grind the other surface parallel to, or square with, that surface.

Needless to say, in order to produce perfectly flat work, the machine should be thoroughly cleaned before starting to finish grind. The magnetic chuck,

R-S Butterfly Valves

to Regulate Flow of Liquids and Gases,

...employ NOPAK Cylinders controlled by NOPAK Operating Valves



In the chemical, paper, petroleum and steel industries, in sewage plants, water works and other utilities, R-S Butterfly Valves are used for fast, accurate flow-control of liquids, vapors and gases. In the interest of speed and efficiency, and to reduce or eliminate manual effort, the R-S Products Corp. of Philadelphia equips many of its valves with NOPAK Air or Hydraulic Cylinders controlled by NOPAK Operating Valves.

The R-S No. 789 Butterfly Valve pictured here is typical. This successful application may suggest how you can use NOPAK Valves and Cylinders in your plant operations, or to improve the performance of equipment that you build for others.

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VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

R-S No. 789 Heavy Duty Butterfly Valve equipped with NOPAK Model "D" 8" x 12" Air Cylinder and NOPAK Valves for optional solenoid or manual valve control.

•

Refer to Sweet's File for Product Designers or write for Bulletin SW-2.

When the spindle on a vertical spindle surface grinder, is exactly square with the chuck face, this characteristic cross pattern is the result.

particularly should be wiped clean and stoned off.

Work out of parallel. This fault is usually traceable to some inaccuracy that has developed in the face of the magnetic chuck. Inspect the chuck for any surface roughness. It is a good practice to rub the chuck lightly all over between jobs with either a fine grit India or Crystolon oilstone to remove any burrs that may have been thrown up by rough castings.

Just as soon as the chuck becomes scratched or worn enough to effect the accuracy of the work, it should be reground. If a circular chuck, check it for flatness by laying a straightedge across its center. If a long rectangular chuck, use a dial indicator clamped to some convenient part of the work head, like the wheel guard. The maximum variation should not exceed 0.0005" if the chuck has been properly ground.

Between loadings, the magnetic chuck should be wiped off carefully, using a piece of flat leather belting.

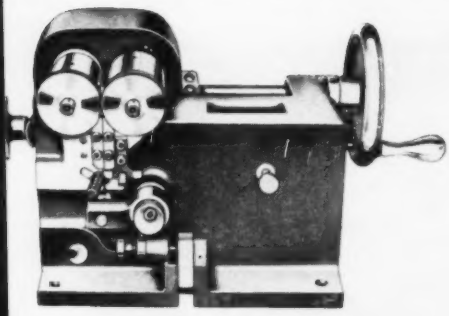
If the work to be ground is a rough casting that has not been previously machined, file the base or grind it on a disc grinder to a clean and reasonably flat and smooth surface for solid seating on the magnetic chuck.

Do not permit the wheel to run off the work entirely at either end of the grinding stroke on horizontal spindle, rotary table machines, nor at the end of the cross-feed on reciprocating table machines, as this will cause the outside edges of the work to become slightly rounded.

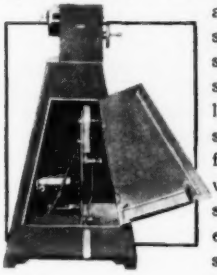
Work out of square. The procedure usually followed in grinding the work square is to first grind two sides parallel, then mount the work in a vise held by the magnetic chuck and grind one side square. The work can then be turned over on the magnetic chuck itself and the opposite side will be ground square; or the vise may be used again. If the work is cylindrical or irregularly shaped, the bottom surface should be packed, using a toolmaker's square to be sure that the side of the work is perpendicular to the face of the chuck.

Scratching of work. Irregular "fish-tail" scratches of varying lengths and widths are generally caused by dirty

Make Any Type Spring, Without Arbors, FAST With Perkins Spring Coiler!



When you need a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with the new Perkins Precision Spring Coiler! You entirely eliminate the use of arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs — coiled either left or right hand, in any desired length, any diameter from 1/16" to 12" and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications for replacements or experimental work. Make them fast right in your own shop!

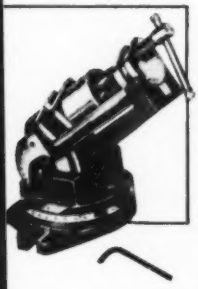


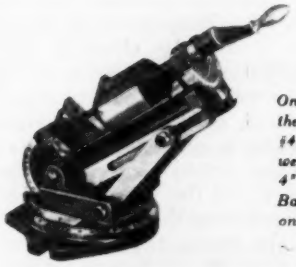
Power model for continuous runs, on welded steel console base.

Hand-operated model for toolrooms, maintenance work or research labs. Approved and used by the Armed Services.

Hold Any Machine Work At Any EXACT Angle With Omniversal Precision Vise!

Accurately set in all three planes in only 15 seconds, this sturdy precision vise made in two capacities saves time and headaches for progressive shop operators and pays for itself quickly. Omniversal #2 is a precision, low-priced vise. Users find it exceptional for grinding compound angles on carbide tools. Weight, 16 lbs. Height, 4¾". Jaws, 2⅛". Opening, 2⅛". Base, 7¼" x 5". For grinding, drilling or general work at any angle, by hand or machine, an Omniversal Vise is the machinist's choice.





Only 7" high (lowest in the trade), Omniversal #4, shown here, is tough, weighs 74 lbs. Jaws are 4" x 1½", open to 4". Base is 9" in diameter one side straight.

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OMNIVERSAL ALL ANGLE VISE
#4 ☐ #2 ☐

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coolant or loose particles of dirt from underneath the wheel guard. It is good practice to flush the underside of the guard when changing wheels.

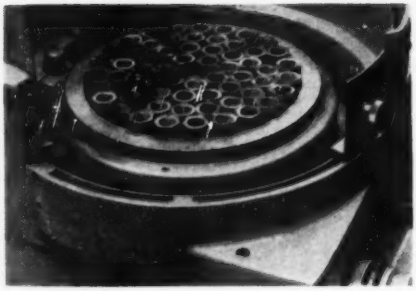
Improper wheel dressing with a diamond will cause a pattern of scratches, or "diamond marks," on the work surface. Make sure the diamond is not cracked or loose in its setting and is properly slanted toward the wheel. Give the diamond a quarter turn every few dressings. Traverse the diamond across the wheel face slowly and evenly. If feed lines from peripheral type wheels persist, round off the edges slightly.

Do not slide the work off the magnetic chuck as this will scratch both the work and the chuck. As a rule, the work can be easily lifted after demagnetizing the chuck.

To protect the ground surfaces of flat steel sheets from being scratched, separate the pieces with strips of oiled paper as each piece is ground.

Burning or checking of the work. Discoloration of the ground surface of steel work pieces is evidence that the surface has been burned and, if hardened steel, probably checked. The grinding wheel may be too hard, in which case, a softer, freer cutting wheel should be used, or the operating conditions changed so as to give the wheel softer grinding action. Increasing the table speed, giving the wheel a coarser dressing, or reducing the area of grinding contact by truing the face or rim to a narrower width will help to achieve this result.

Work sliding on the magnetic chuck. Stops of some sort must be used to prevent work from sliding. The magnetic chuck holds the pieces down but does not hold them sideways, except by friction between the piece and the chuck face. Therefore, light pieces should always be blocked either sideways or endways, depending upon the type of surface grinder, to prevent the work from sliding or spinning.



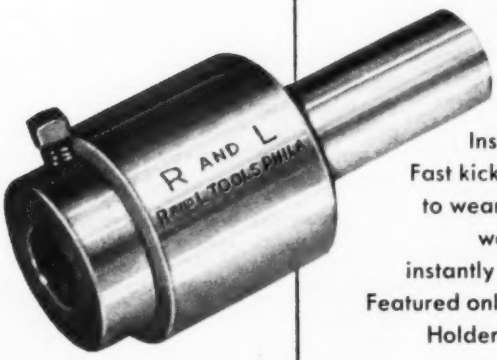
By omitting two innermost rows of parts, the grinding cycle was speeded up in this operation. Avoid filling chuck area completely.

On vertical spindle, reciprocating table type machines, the work should be placed on the chuck so that it is under the center line of the wheel when grinding. This neutralizes the forces that would tend to spin the work.

Wheel loading. Metal lodged in the wheel pores indicates a loaded wheel. Use either a coarser grit wheel or a porous type (open structure) wheel to provide more chip clearance, or a softer grade wheel that will break down more readily. If the wheel is loading because it is slightly hard, try increasing the table speed. In this connection, it is well to remember that when grinding on a rotary table machine, the work speed near the center of the table is much less than that at the outside edge. Thus, for a small piece chucked near the center, a relatively high table rotation speed should be used.

If loading persists, check the diamond to be sure it is sharp and give the wheel a very open or coarse dressing by using a relatively heavy feed and rapid traverse. Check the supply of coolant flowing on to the wheel and the work, and be sure it is not dirty or too oily. High detergency (ability to keep the wheel face clean and sharp) is an important

fast!



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Instant engagement at full contact! Fast kick out clutch! No spring plungers to wear or break! No small screws to work loose! Right to left threading instantly with new release mechanism! Featured only in the R and L Tap and Die Holder!

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RIGHT R and L LEFT TOOLS

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Hand stoning the chuck of a rotary surface grinder. Between jobs, it is good practice to rub over the chuck surface with a fine or medium oilstone to remove any burrs.

property of water soluble grinding fluids.

Wheel glazing. Inexperienced operators on vertical spindle rotary table type machines are sometimes prone to use too light downfeeds because of fear of burning and displacing the work. This causes the wheel to glaze since there is insufficient pressure to break down the wheel face. Simply increasing the downfeed will correct this condition.

Glazed wheels are also caused by insufficient coolant, too hard grade wheels and too fine grit wheels. Checking the diamond to make sure it is sharp and giving the wheel as coarse a dressing as the finishing requirements will permit are also helpful.

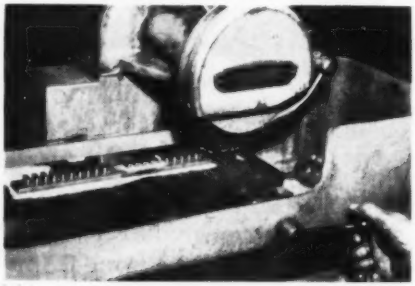
Chatter Marks. These are caused by vibration from one source or another. On surface grinders of either the rotary or reciprocating table type employing the periphery of a straight wheel, chatter marks can result from any one of several conditions, such as worn, or inadequately lubricated wheel spindle, or other vital moving parts, wrong table speed, wheel out of balance, or out of truth, wheel too hard, lack of solid foundation for the machine, or proximity to vibrating machines, such as punch presses.

On light finishing cuts, the grinding wheel may glaze, become dulled and leave chatter marks on the work. This condition is usually corrected by redressing the wheel with a sharp diamond and taking a minimum number of passes to produce the desired surface and accuracy.

On machines equipped with a balancing type wheel sleeve, balance the wheel assembly before starting to grind with a new wheel. Be sure also to rough true the wheel on the machine before balancing it in the conventional manner on a balancing stand and then finish true the wheel after remounting on the machine.

Grooved and slotted surfaces. The grinding of a flat surface containing grooves or slots, such as cast iron cored plates for hydraulic machine tools, is an unusually exacting job. A typical plate presents a honeycomb of holes and cored slots and must be ground perfectly flat in order to hold 125 pounds oil pressure in the grooves without the use of a gasket. To keep the edges of the grooves absolutely square, as required, the wheel must be sharp and free cutting throughout the grinding cycle; any dulling of the wheel causes pressure to be built up and when the wheel approaches a groove, the reduced contact area permits the wheel to cut deeper, thereby destroying the surface flatness.

This shows the permanent type magnetic chuck that has adequate holding power for small parts.



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Simonds grinding wheels have the right combination to put *you* in the 'chips' . . . the quality controlled combination of grain size and bond strength to stack up production . . . the sure combination for economical grinding, fast stock removal and long wheel life. Complete line includes everything for roughing, finishing, cutting off, polishing and sharpening. Whether *you* need grinding wheels, mounted wheels and points, segments or abrasive grain . . . you'll find Simonds your best deal for best results.

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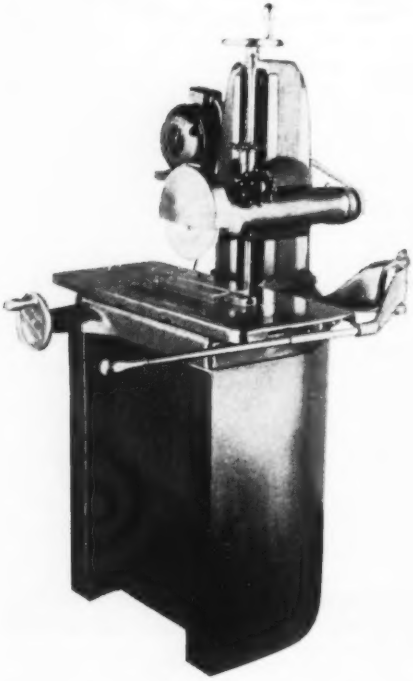
Descriptions of late model surface grinding machines

Crosman's utility t-square action

J. B. Crosman & Son, Inc., East Walpole, Mass., manufacture an improved surface grinding machine on which tools, dies and small machine parts can be accurately and quickly ground. The t-square action principle does away with the usual intermediate table or alternative moving spindle housing. The table rests directly upon the plane ground surface of the bed and is guided longitudinally and laterally by the t-square action control.

Either bench or floor mountings are offered with Crosman's t-surface grinding machines. The motor drives the spindle through a flat belt, and is mounted on a pivoted base readily adjustable to give proper belt tension. A 1/3 h.p., 110 volt, 60 cycle, single phase, standard motor is regularly furnished. A 1/2 h.p. motor of any current characteristics can be furnished when necessary for greater stock removal.



B & S 2L and 2LB

These machines are designed and built for efficient surface grinding with precision and fine finish on small and medium size work, by Brown & Sharpe Mfg. Co., Providence, R.I.

Some of the features are: (1) convenient controls for fast, accurate manipulation; (2) two rates of table feet (2L machine)—19 ft. or 31 ft. per minute; (3) precision wheel spindle provides exceptional grinding finish with quick spark-out; (4) full automatic lubrication and strategically-placed dust guards; (5) rigid column construction; (6) electrical controls enclosed in separate compartment.

The convenient location of all controls and adjustments permits rapid

SPECIALLY ENGINEERED

for today's high-speed finishing methods

LIGHT—HIGH POWERED

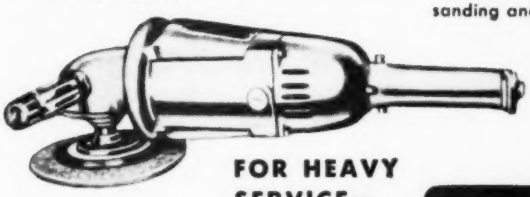
New No. 870 Sander

Weighing only 7½ lbs. — yet with full .5.5 ampere rating and designed for continuous production use — this beautifully engineered 7" sander sets new standards in its field. No load speed is 4500 r.p.m., making the No. 870 perfect for use with the new laminated phenolic wheels and discs. In every way, this new Millers Falls No. 870 is an outstanding performer for fast sanding, wire brushing, grinding and polishing.

FASTER— MORE POWERFUL

New No. 270 Polisher

Greater power (5 amperes) and a higher speed (1900 r.p.m.) make this newly designed 7" unit ideal for use with the latest-type cleaners and polishes which have recently found such favor. Light and compact, it handles beautifully and gets at the less accessible surfaces. It's supplied with a deep carpet-pile wool pad, the most effective polishing head ever developed. The new No. 270 is also highly efficient for rubbing, sanding and grinding.



FOR HEAVY SERVICE—

No. 900 Sander

With 8.0 ampere rating, this powerful 7" sander has long been a favorite in hundreds of shops. Regularly equipped with flexible rubber and Co-ro-lite pads for sanding, it also offers exceptional, smooth-running performance with cup grinding wheels and wire cup brushes for a wide variety of finishing operations.

Free On Request

Complete data on Millers Falls broad line of high performance electric tools for production and maintenance. Millers Falls Company, Greenfield, Mass.

MILLERS FALLS TOOLS

SINCE 1868 ®

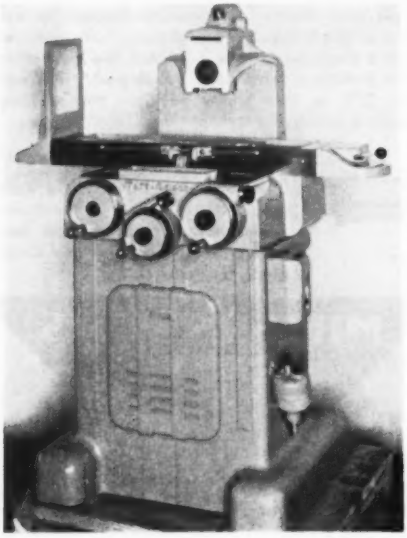
The Mark of Superiority

setup and provides exceptional ease and efficiency of operation for greater production and less fatigue. There is automatic lubrication.

Taft-Peirce No. 1

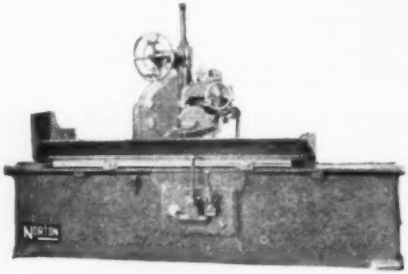
The No. 1, precision surface grinder made by The Taft-Peirce Mfg. Co., Woonsocket, R.I., is built more sturdily than many machines of this type. Ball mountings and bearings throughout permit extreme precision and uniformity of the parallel and rectilinear motions which are indispensable to precision surface grinding. This assures extremely close limits of tolerance. Among features is a tilting wheelhead which makes the machine suitable for difficult angle and shoulder work. There are hardened and ground ways and the table, saddle and column move on ball bearings.

The grinder employs a unique feature in the mounting of the wheel spindle, which swivels in a vertical plane about the center of the wheel. The spindle is carried in an accurately bored cast iron block mounted between two pairs of circular dovetail slides, permitting swiveling of the entire spindle about the wheel center through an arc from horizontal to 30° below center



Norton 10" hydraulic

This 10" hydraulic surface grinder made by The Norton Co., Worcester 6, Mass., is a heavy duty reciprocating table-type machine. Table reciprocation is accomplished hydraulically by an improved type of hydraulic drive. Automatic and hand cross feed arrangements are supplied. Wet grinding attachment complete with pump and tank included as standard equipment. Magnetic chucks and individual dust exhaust systems available as extras.



There are four sizes. Table top to wheel bottom is 12½" or 10". Table speeds, adjustable up to approximately 100 f.p.m. The wheel is a No. 1, straight 10x1½x3. The nominal lengths for the 24, 36, 48 and 60 are 98, 122, 146 and 170 respectively. The widths are all the same, 67.

DoAll tool room model

Grinders offered by DoAll Co., Des-Plaines, Ill., stress performance as reflected in reliability of feed control calibrations and in finish and flatness of the work.

An outstanding feature is the fact that attachments are available to make these surface grinders virtually completely automatic. For example, the grinder can be arranged to downfeed

Look to MODERN for accurate, fast, economical thread cutting

Hardened and ground throughout

Wider threading range

Made with least number of parts

Cut close-to-shoulder threads without special chasers

Easily adjusted for thread size

Greater flexibility

Quick and easy chaser change

MODERN
STATIONARY TYPE SELF-OPENING
DIE HEADS

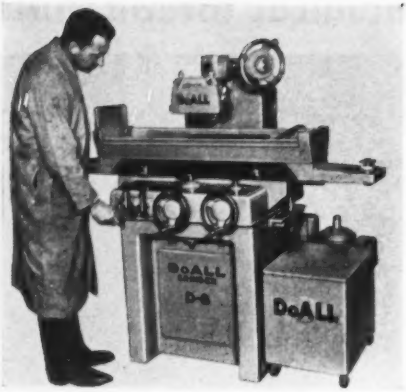
Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- CHASER GRINDING FIXTURES

Modern Self-Opening Die Heads thread diameters from 1/8" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

For complete information, write for Bulletin No. M-124

MODERN TOOL WORKS
DIVISION
CONSOLIDATED MACHINE TOOL CORPORATION
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED
ROCHESTER, NEW YORK



automatically for plunge form grinding and stop at the required place, or cross-feed and then downfeed automatically for automatic surface grinding operations.

Variable speed spindle, wheel guard innovations — unnecessary to remove guard when removing wheel—three cooling methods in one, high speed spindle attachment, variable speed cross feed control and hand wheel slip rings and operating levers are other features.

Reid Model 618V

The Reid Model 618 V precision surface grinder with variable table speed solves the problem of grinding various metals and materials of different hardnesses that are being used more and more in modern manufacture. It is made by Reid Bros. Co., Inc., Beverly, Mass.

By turning a hand wheel the speed can be adjusted from 12 to 35 f.p.m. Available in four models; mechanical units built around one-piece column casting; adjustable dust guard for work of different thicknesses; all hand wheels correctly positioned at the operator's finger tips; one shot lubrication; variable speed table control; table has three t-slots, chain driven and runs on one v-way.

Specifications of American-built surface grinders

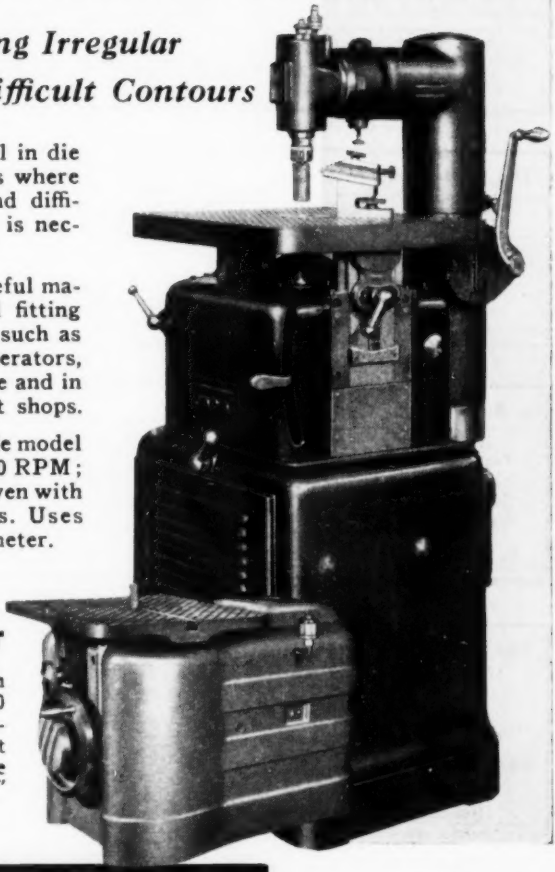
Reid Brothers Company, Inc. — **Beverly, Mass.**

Type and Model	Capacity	T=Table Working Size TS=Table Speed	Grinding Wheel	Remarks
Surface Grinder No. 618	6"x18"x15¼" high	T=6"x18"; TS=Any Speed from 12 to 35 F.P.M.	7"x½"x1¼"	Four Models: 618 V, power feed table; 618 VL, power feed table, one-shot lubrication; 618H, hand feed; 618 HL, hand feed and one-shot lubrication

Boyar-Schultz

No. 2 PROFILE GRINDER

. . . for grinding Irregular Shapes and difficult Contours



A standard machine tool in die shops and in tool rooms where grinding odd shapes and difficult, irregular contours is necessary.

It is a particularly useful machine for grinding and fitting large dies and punches such as formin₆ dies for refrigerators, table tops, sanitary ware and in automotive and aircraft shops.

Spindles in dual spindle model illustrated, turn at 10,000 RPM; stock removal is rapid even with small diameter wheels. Uses wheels ¼" to 3" in diameter.

No. 1 Profile Grinder

A bench model with spindle speed of 20,000 RPM. Performs in minutes, many jobs that would ordinarily require hours. Uses wheels ⅛" to 1" diameter.

BOYAR-SCHULTZ Corporation

2108 WALNUT STREET, CHICAGO 12, ILL.

WRITE FOR LITERATURE FULLY DESCRIBING THESE TIME SAVING MACHINE TOOLS

Brown & Sharpe Manufacturing Company — Providence, R. I.

Type and Model	Capacity	T= Table Size L=Max. Long. Table Travel TM=Max. Trans. Movement	Wheel Size	Horsepower
Surface Grinder No. 2L	18" long, 6" wide, 9½" high	T=6"x18"; L=20"; TM=6½"	7"x½"x1¼"	1½ h.p.
No. 5 Hydraulic	24" long, 8" wide, 11" high	T=8"x24"; Vert. Adjustment of wheel spindle slides=12"	10"x¾"x3"	1½ h.p.

The Taft-Peirce Mfg. Co. — Providence, R. I.

Type and Model	Height Under Wheel	Table Working Surface	Grinding Wheel Size	Horsepower
Surface Grinder No. 1	12"	5" to 12"; Long. Travel of Table=13½"	7"x½"x1¼"	¾ h.p.

J. B. Crosman & Son, Inc. — East Walpole, Mass.

Type and Model	Capacity L=Longitudinal T=Transverse	Table Top to Bottom of 7" wheel	Wheel Size	Horsepower
Surface Grinder Type Hand feed	L=8"; T=4"	10"	7"x½"x1¼"	½ h.p.

The DoAll Company — Des Plaines, Ill.

Type and Model	W=Workheight Capacity C=Chuck Capacity	T=Table Size TT=Table Traverse	Wheel Size	H=Horsepower W=Wheel Surface Speed
Toolroom Surface Grinder D6-1 Manual or Hydraulic	W=12½"; C=6"x18"	T=6½"x19¾"; TT=7½"x20"	7"x½"x1¼"	H=1 h.p.; W=6000 f.p.m.
D6-3	W=12½"; C=6"x24"	T=6½"x24"; TT=7½"x26"	do	do
D8-1	W=12½"; C=8"x24"	T=8½"x24"; TT=10"x26"	10"x¾"x3"	H=3 h.p.; W=6000 f.p.m.
D8-3	W=12½"; C=8"x24"	T=8½"x24"; TT=10"x26"	14"x1"x3"	do
D10-1	W=12½"; C=10"x30"	T=10"x30"; TT=12"x32"	10"x¾"x3"	do
D10-3	W=12½"; C=10"x30"	T=10"x30"; TT=12"x32"	14"x1"x3"	do

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 728 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

ACHIEVING PERMANENCE OF ACCURACY

Just as important as the initial accuracy of a precision machine tool is the *life expectancy* of this accuracy. And the most effective way to insure long-lasting accuracy is to give *dimensional stability* and *wear resistance* special consideration during machine design.

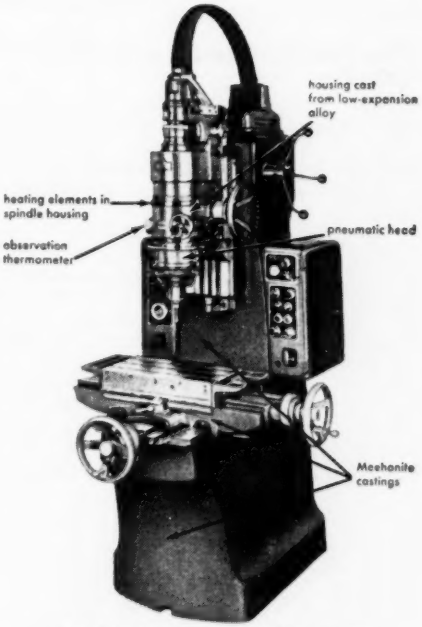
The following causes of dimensional *in*stability are most frequently encountered: thermal expansion, unstable constituents in the material; and stresses in the material. In the design of the No. 2 Moore Jig Grinder, all of these factors were taken into account and special features were incorporated to counteract them.

All the inherent accuracy of a measuring system, capable of positioning the workpiece in relation to the spindle within a tenth, is rendered nearly valueless if the spindle does not retain its position during machining operations. Such movement, caused by thermal expansion, is inevitable unless steps are taken during design to minimize or prevent it.

Electric heating elements were incorporated in the main spindle housing of the Moore Jig Grinder to maintain uniform temperature—whether machine is running or not. An observation thermometer is located so as to indicate any abnormal temperature change within the housing. The housing itself is cast from 36% nickel iron to further minimize effects of temperature variations. And a pneumatic head directs air onto the workpiece, preventing undue temperature rise both in the workpiece and in the locating members of the machine.

Instability resulting from gradual relaxation of locked-in stresses in castings is prevented by suitable stress-relieving cycles during the manufacture of Moore machine components. Similarly, the best way to avoid unstable hardened steel parts is by tempering them. Moore follows this practice.

Further wear resistance was built into the Moore Jig Grinder by means of: adequate way and bearing surface, scientifically proportioned to minimize and distribute wear; all reciprocating parts of nitrided steel—almost as wear-resistant as carbide; pressure lubrication of ways; lead screws and nuts made from nitrided steel and aluminum bronze, respectively, combining to offer low coefficient of friction, abrasion resistance and hardness; and dust protection devices.



Special design features of the No. 2 Moore Jig Grinder insure permanence of accuracy.

ACHIEVING GREATER ACCURACY QUICKLY

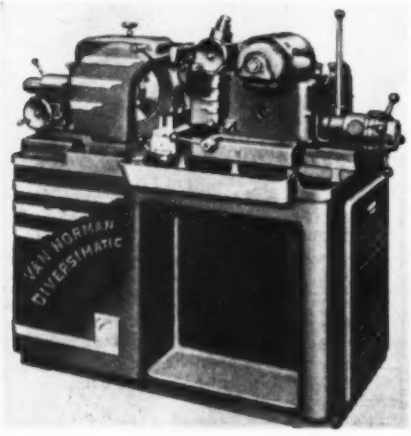
is the job of Moore Jig Grinders and Moore Jig Borers. Both make possible accurate lead screw settings within .0001". This team will produce precision holes, contours and surfaces *in your shop* at minimum cost. For detailed catalogs, write to: Moore Special Tool Company Inc., 728 Union Avenue, Bridgeport 7, Conn.

Norton Company				Worcester 6, Mass.
Type and Model	Table Top to Wheel Bottom	Vert. Movement Wheel Head	Wheel Sizes	Table Speed
Surface Grinder 6"x18" Hydraulic	10¾"	10¾"	8"x(½" to ¾") x1¼" or 7"x(½" to ¾")x1¼" (No. 1 Straight)	Up to 50 f.p.m.
8"x24" Hydraulic	12½"	14½"	10"x1"x3" (No. 1 Straight)	Up to 70 f.p.m.
10"	12½" Available in four lengths: 24"; 36" 48", 60"	10"	10"x1½"x3" (No. 1 Straight)	Up to 100 f.p.m.

Van Norman adds centerless grinder

The Van Norman Co., Dept. BB, Springfield, Mass., announces the addition of the Diversimatic centerless grinder to its line of oscillating radius grinders and production cylindrical grinders.

The Diversimatic is claimed to be an ideal machine for grinding a great variety of parts such as bearings, bushings, cap screws, shafts, formed parts of two or more diameters or contours. It is especially suited for grinding parts used in office machines, instruments, small aircraft parts, munitions and other similar work. It is a precision-built grinder having many features including: special easily removable grinding wheel, spindle quill, with combined double-row super precision ball and roller bearings, sealed and lubricated for life assure trouble-free operation; spindle requires no warm-up period; combination straight and contour grinding wheel dresser; straight screw-type regulating wheel dresser; grinding wheel diamond constantly flushed from below with coolant during wheel dressing; infinitely variable ¼ h.p. regulating wheel drive, 30 to 300 r.p.m.; large 1⅞ inch 4 thd. Acme infeed screw with full length split type nut to compensate for wear; work-rest adjustable for position; may be fixed across the ways or made to feed in and out with the regulating wheel.



Mechanics Through the Ages

A collection of 63 of the more popular mechanics cartoons published in the MACHINE and TOOL BLUE BOOK over the past few years. Bound in a hard-cover it withstands constant wear. Cartoons are instructive, entertaining and make worthwhile reference tools. Available from Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Ill. Price: One dollar.

Sid Tool Company

WHY WAIT FOR SPECIAL TAPS?

. . . Has them IN STOCK for IMMEDIATE DELIVERY!

HIGH SPEED | SPECIAL | RIGHT HAND TAPS

SIZE	THREAD
4	32-48-80-64
6	30-32-36-48-80
8	36-40-48-80-80
7	32-40
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-16-18-20-24-26-27-28-32
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5½-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	6
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4½-10-12

- *SPECIAL AND LEFT HAND DIES IN STOCK*

Prices on Application **We are always adding new sizes**

NOTE: Oversize — Undersize — Metric — 64th and 32nd Size Taps Available for Quick Delivery.

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SID TOOL COMPANY, INC.

CUTTING TOOL SPECIALISTS

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PHONE: BE 3-4270

STANDARD Gages

Your Choice of Many Gages

Dial Bore Gages

The New Size 00 with Centering-Size Discs

Range ¼" to ⅜"

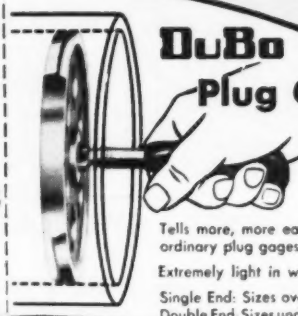
Pat. Appl. For

8 Sizes cover range ¼" to 12⅛" (with extensions to 16")

Standard, Vertical and Pistol-Grip Types

DuBo Plug Gages

Patented



Tells more, more easily, than ordinary plug gages.

Extremely light in weight.

Single End: Sizes over 1.510"
Double End: Sizes under 1.510"

Dial Indicators

Consistently accurate. Shockproof. A wide range of sizes and graduations, including Long Range, 90 Degree, Long Stem and Decimatic models.

Dializers

An economical, effective means for converting AGD Adjustable Limit Snap Gages (Models A, B or C) to Dial Snap Gages. Easily installed or transferred from one frame to another.

Patented

Dial Snap Gages

Comparator (shown here with optional stand), Encased and Decimatic Types

Stock sizes cover range 0" to 8"

Larger sizes available

Adjustable Limit Snap Gages

AGD designs in both regular and midget models.

Also . . .
Master Setting Gages
Comparators
Dial Depth Gages
Dial Pin Gages
Adjustable Limit Length Gages
and Others . . .
Write for New Catalog C

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

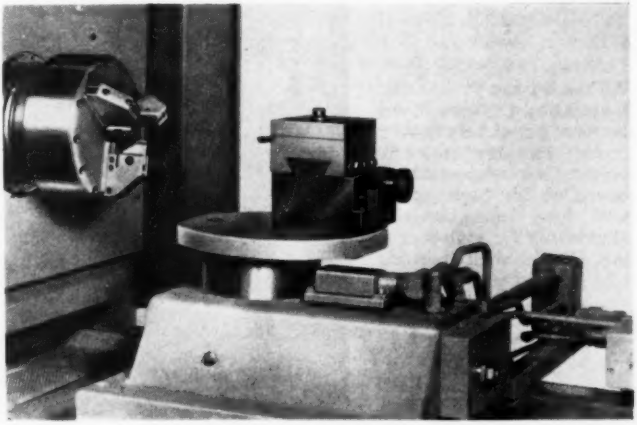
MODERN TOOLS in ACTION

Boring Spherical Bearing Seats

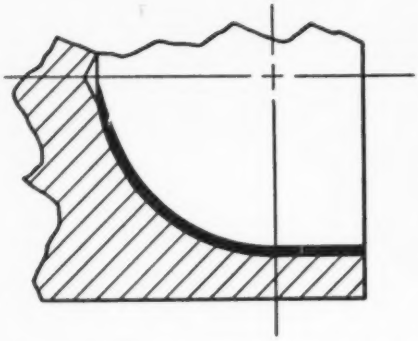
HERE'S A SPHERICAL boring operation done on a single-end standard Ex-Cell-O precision boring machine. The operation combines a straight bore and a spherical seat in small bronze bearings that range from about $\frac{3}{8}$" to $2\frac{1}{16}$" in outside diameter. Total limits an both straight and spherical diameters vary from .0003" to .0005", depending on the size of the parts. Net production is 84 pieces per hour for the largest part, and increases to 151 for the smallest parts.

The work is held in an air-operated diaphragm chuck. Different sizes of parts are accommodated by interchangeable jaws and end stops. The boring tool is supported on a turret which remains stationary while the table feeds in to finish the straight portion of the bore. Then the table engages a positive stop and the turret rotates to finish the spherical seat. The turret is

2. The parts range from about $\frac{3}{8}$" in diameter to over 2".



1. Close-up view of Style 2112-A Precision Boring Machine equipped for boring straight and spherical areas of bronze bearing seats.



3. This sectional drawing shows in heavy lines the straight bore blending into a spherical seat.

operated by two opposed hydraulic cylinders which eliminate any possibility of backlash.

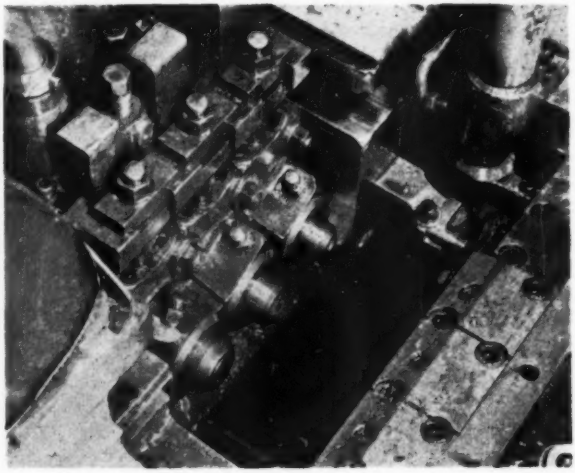
Compact continuous tube mill features unique drive system

A highly compact electric weld tube mill, designed and built by the Herr Eng. Co., Dept. BB, Warren, Ohio, is said to produce a wide variety of sizes and types of tubing. The mill forms flat stock, welds the joint, burrs the seam, and sizes the tube in one continuous operation. It has ten roll passes, six in the forming section and four in the sizing section. A short center distance (11¼") between roll stands reduces over-all length of mill. This is made possible through use of cone-drive double enveloping gearing in the ten speed reducers used in the drive system.

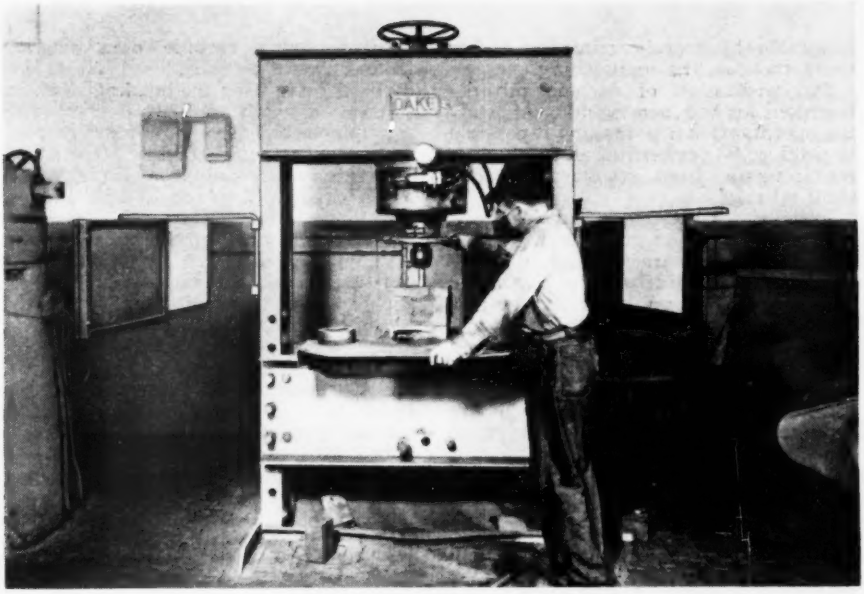
The small 2" center distance of the reducers nearly equals that of the rolls, permitting the universal joint assemblies to be almost parallel to each other. This provides a smooth drive and also reduces over-all height of the rolling units.

Standard nibs of carbide for bolt heading meet 93% of requirements

As a result of a standardization program, Carboloy standard die nibs (new sizes) now can be used for jobs formerly requiring nibs at higher cost, according to Carboloy, Dept. of Gen. Electric Co., Detroit 32, Mich. For rivet production the standard nib sizes are completely



All three pairs of dies and hammers in this cold header have improved grade 190 Carboloy inserts to help keep machine operating at high speed with long runs between shutdowns for tool servicing. Off-the-shelf carbide nibs help keep costs down.



DAKE PRESS REPLACES THE "HERNIA METHOD" OF KNOCKING OUT DIE INSERTS

The job of knocking out forging die inserts formerly required two men, and sometimes several hours of hand sledging. Now one man does it easily in a few minutes with a Dake 125-ton Air-hydraulic Press.

The die and drive pin are placed under the press ram as shown, and pressure is applied up to the 125-ton capacity. If pressure alone fails to break the insert loose, heat is applied around the die until expansion permits breakaway, which comes with a sudden impact under the sustained high pressure.

Savings in labor costs have been tremendous, and labor relations have been greatly improved.

Dake Hydraulic Presses have scores of uses in industry. A variety of styles and capacities makes them adaptable to almost any requirement. We suggest that you contact your nearest Dake representative about your pressing problems—or write us and we will ask him to call.

Dake Engine Company, 608 Seventh St., Grand Haven, Mich.

DAKE PRESSES

adaptable by merely removing a few extra thousandths in finishing.

Standardization of carbide nib dimensions for bolt, screw and rivet heading operations is now making it possible to produce 93 per cent of all production requirements from standard off-the-shelf nibs.

Initially, for heading work, the problem was to obtain a grade with the desired physical characteristics to overcome the major difficulty of shrinkage and warpage found in earlier grades. Also it was necessary to produce a material that could be easily drilled and machined to overcome the costly lapping operation.

Improved Carboloy grade 190 is the type used. Today nibs of this grade can be held to close and consistent tolerances and can be readily drilled and turned, it is claimed.

In designing carbide dies, several factors should be considered. While the carbide grade used for heading work is considered tough and soft as compared to other carbides used for cutting tools and wear resistant applications, its hardness and modulus of elasticity are much greater than steel. This means that the carbide does not deform or "give" to the same extent as steel dies.

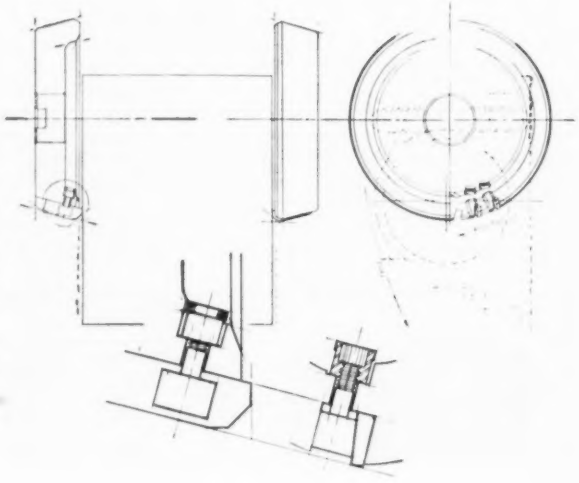
Popularity of carbides is currently growing fastest in the production of such bolt and screw sizes as No. 4, 5, 8, 10 and 1/4 inch, etc.

The accepted "successful" range of carbide heading dies applications now include nominal bolt sizes up to 3/4 inch.

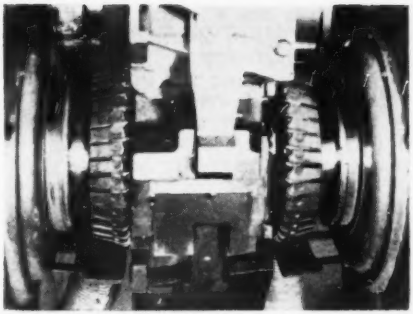
Most type rivets are currently produced with carbide dies and hammers, particularly those in the high volume field under 3/8 inch diameter.

Tungsten carbide milling cutters increase production, reduce down time, cut maintenance

Straddle milling 3500 cast iron automatic transmission gear cases per tool grind is being performed on a 20-horsepower Davis Thompson drum-type mill using two units for rough milling and two for finish milling. These four 12-inch diameter cutters are "MF" axial face Kennamils produced by Kennametal, Inc., of Latrobe, Pa. Each having 36 solid blades of Kennametal Grade K6, they are run at 26 inches per minute feed rate, 0.009" feed per tooth, 250



1. Straddle milling cast iron gear cases with Style MF face Kennamill. Operation done on Davis Thompson drum type mill using four cutters—two roughing, two finishing. Drawing shows how blades are held in cutter. Wedge-screw is piece hardened alloy steel pulled tight with socket screw. No threads in cutter body.



2. Straddle milling cast iron gear cases on a Davis Thompson drum type mill using two Style MF face Kennamills for rough milling and two for finish milling. Cutters are 12" dia., having 36 solid wedged-in blades, Grade K6. At 26 i.p.m., .009" feed per tooth, and 250 s.f.m., 3,000 to 3,500 pieces are straddle milled per grind.

s.f.p.m. at 80 r.p.m. Average depth of cut for the roughing cutters is 3/16" on each side. For the finish cut about 1/32" of stock is removed per cutter.

Under similar operating conditions, 3000 to 3500 pieces may be straddle milled before cutters require any regrinding. Reconditioning time per cutter is only one hour. Resharpening consists of diamond finishing both corner and face angles on the solid tungsten carbide blades. Snagging and roughing usually required on brazed tooth cutters are eliminated.

In another interesting instance, a large steel plant uses Kennamills as "two-in-one" cutters. They formerly milled flats on the 13" dia. journals of their 22" dia. steel work rolls (35 to 40 Scleroscope) with a high-speed steel inserted-tooth cutter. Since this type of cutter has to be run at a lower speed and feed, it required eight hours to mill two flats per roll. Same job is now processed in only one hour with a 12" CFL Kennamill, having twenty solid tungsten carbide blades of Kennametal Grade K2S.

Operation is performed on a 20 h.p. Cincinnati Hydraulic side mill at 100

revolutions per minute with the Kennamill projecting about 12" beyond the machine face. Feed is 10" per minute, chip load is 0.010" with a ⅛" to 7/16" maximum per pass depth of cut. Because of the limited horsepower and unavoidably excessive cutter overhang, severe vibration was experienced when the 12" mill was first tried. This condition was minimized by setting the twenty solid carbide blades as follows:

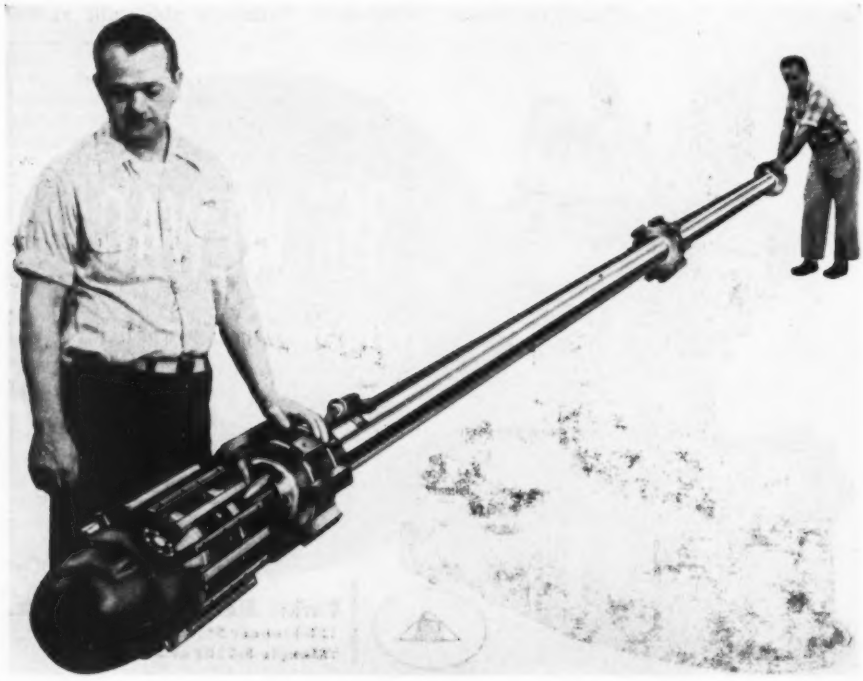
First, ten blades were set up in alternate slots with their cutting end projecting approximately 0.032" from the cutter body. Then, the other ten blades were inserted in the remaining slots and allowed to project approximately 0.040" beyond the first set.

To obtain the 9" wide by 13" long flat (finish milled area), total depth of cut is approximately 1½". This is made in five passes with the first cut being 7/16" deep. Each successive cut is made at reduced depth as the size of the milled area increases. With only ten blades doing the cutting and the depth of cut decreased for each successive pass, required horsepower is reduced and vibration greatly minimized.

After milling four or five flats, blades projecting farthest from the body are dropped back in their slots to permit continued milling with the remaining ten blades; thus, in effect, providing two cutters in one. Only 0.010" to 0.015" edge wear need be removed to resharpen the tungsten carbide blades.

Micromatic tool hones and gages 280 mm. atomic gun barrel

With the successful testing of the new 280 mm. atomic gun on the firing range, Micromatic Hone Corp., 8100 Schoolcraft, Detroit, Mich., is releasing de-



tails on its 69-foot-long tool which is used to microhone the bore of the gun barrel.

Designed and built by Micromatic, the tool has a gage in its nose, making it possible to check the diameter of the bore at any point throughout its full length, without removing the tool from the bore, or the barrel from the machine. This new tool is reducing by 80% the time that the barrel is at the microhoning machine.

After the barrel has been microhoned to remove all rings, steps, and geometric inaccuracies resulting from previous operations, the diameter is checked in 30 seconds, by means of dials, at a conveniently located control station. The 33-foot-long barrel can be checked completely, within .0003" tolerance, in just a few minutes; previously, large gun barrels of this type required a full day for the checking operation. The distance from the muzzle end to the point where the diameter is being checked is also indicated on dials.

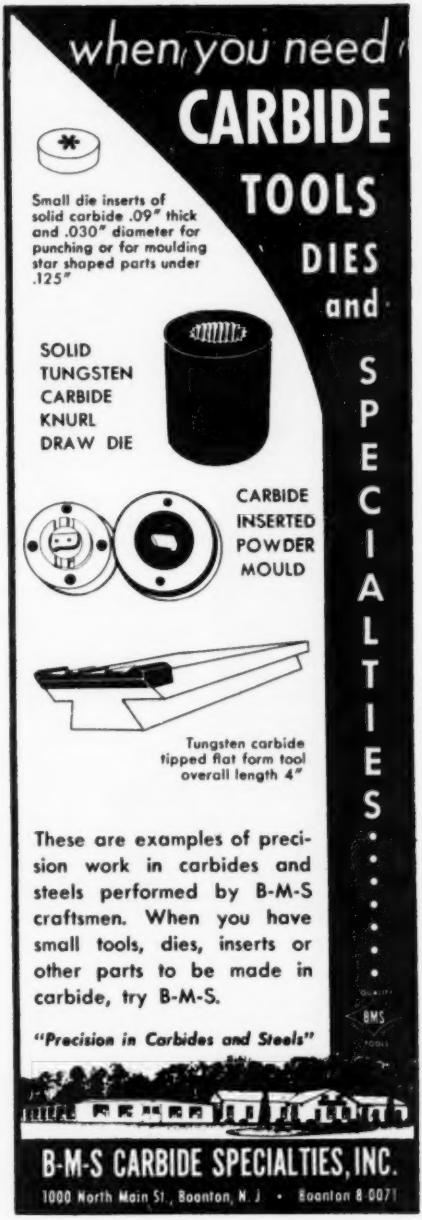
Because microhoning simplifies processing, all types and sizes of gun barrels are now being microhoned before the rifling broach of scraping the barface, there is less chance of damaging the rifling broach or scraping the barrel. The microfinished surface assures a tight seal between the barrel and the projectile, maintaining both the full force of the explosion and the accuracy of the gun.

Other parts of large guns which are microhoned include the cylinders and rods of the recoil, recuperator, and body mechanisms, plus components of the breech assembly.

Solid gripping capacity possible with self-setting clamps

Kord Mfg. Co., Inc., 4510 White Plains Road, New York 70, N. Y., is using new improved Autoset self-setting clamps for holding dies in power presses. The clamps are distributed by Alpha Tool & Supply Co., Closter, N. J. Clamps are suitable for machine shops, production processes, or any job which requires a solid gripping capacity.

Mr. Unger, president of Kord Co.,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Gages available for checking "O" Ring, Truarc and other retaining ring grooves.

says: "The Autoset self-setting clamp adequately holds valuable dies in our power presses. We don't have to worry about clamp failure anymore. All that is necessary is a simple tightening operation, instead of looking for packing or adjusting step blocks. What is most important to us is that the clamp saves time and is accurate with equal pressure on three points, which means increased production.

"Die replacement cost is expensive. If damaged by clamp slippage, time wasted making new ones is very costly, and with material shortages we may not get the quality die desired. With a standard clamp, packing is required, extra labor is involved in setting time and often grip failure results because of an improper hold."

National Metal Show Oct. 19-23

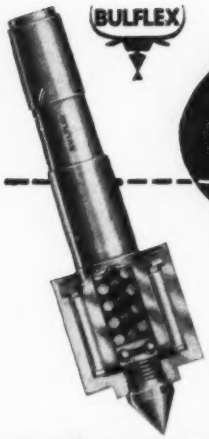
THE 35th NATIONAL Metal Congress and Exposition will be held Oct. 19th through the 23rd at Public Auditorium, Cleveland, Ohio. The technical meetings for American Society for Metals will be held at Hotel Statler and for the American Welding Society at Hotel Cleveland. The Institute of metals division and the American Institute of Mining and Metallurgical Engineers meet at the Allerton hotel, and the Society for Non-Destructive Testing at the Hotel Hollenden.

The theme for this year's meeting is "Metals Market Place of the World." Over 400 nationally-known firms engaged in either the production of metals, their treatment or fabrication into component parts or products, will exhibit. 210,000 sq. ft. of floor space, nearly five acres, will be utilized.

Work which has appeared in previous ASM metallographic exhibits is not acceptable.

Eleven classifications of micros are designated for the contest, including tool steels and tool materials; stainless and heat resisting steels; other steels and irons; aluminum, magnesium, beryllium, titanium and their alloys; copper, zinc, lead, nickel and their alloys; metals and alloys

The public auditorium at Cleveland, Ohio where the National Metal Congress and Exposition will be held October 19th, through the 23rd.



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not otherwise classified; series showing transitions on changes during processing; surface phenomena; results by unconventional techniques (other than electron micrographs); slags, oxides and inclusions; welds and other joining methods.

Technical meetings and subjects to be discussed by the **American Society for Metals** on Monday, Oct. 19, include: Determination of Oxygen in Titanium and Zirconium by the Isotopic Method; Vacuum-Fusion Analysis of Molybdenum; Nitriding of Titanium with Ammenia; Heat Treatment of High-Strength, Titanium-Base Alloys; Transformation Kinetics and Mechanical Properties of Titanium-Aluminum-Molybdenum Alloys; Transformation Kinetics and Mechanical Properties of Titanium-Aluminum-Chromium Alloys; Isothermal Transformation of Titanium-Manganese Alloys; Correlation Between Heat Treatment, Microstructure and Mechanical Properties of Titanium-Molybdenum Alloys.

On Tuesday, Oct. 20, discussions will be: Transverse Mechanical Properties of Slack-Quenched and Tempered Wrought

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On Wednesday, Oct. 21, there will be discussed: A Hypothesis for the Boron Hardenability Mechanism; The Effect of Boron on Notch Toughness and Temper Embrittlement; A Study of the Fe-Fe_2B System; The Carbonitriding of Boron Steels.

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On Thursday, Oct. 22: The Effect of Silicon on the Kinetics of Tempering; Microstructural Changes on Tempering Iron-Carbon Alloys; Effect of Chemical Composition on Susceptibility of Steels to Temper Brittleness; The Embrittlement of Alloy Steel at High Strength; Equillbrium Structures in Fe-Cr-Mo Alloys; A Survey of Vanadium Binary Systems; Gamma Loop Studies in the Iron-Vanadium and the Iron-Vanadium-Titanium Systems; High Temperature Transformations in Ferritic Stainless Steels Containing 17 to 25% Chromium; Intergranular Corrosion of Ferritic Stainless Steels; Grain Growth in High Speed Steel; Discontinuous Grain Growth in High Speed Steel.

On Friday, Oct. 23: Strain Aging Behavior of Rheotropically Embrittled Steel; Flow and Fracture of Single Crystals of High Purity Ferrite; Notched Bar Tensile Properties of Various Materials and Their Relation to the Unnotch Flow Curve and Notch Sharpness; Effect of Some Solid Solution Alloying Elements on the Creep Parameters of Nickel.

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The Institute of Metals Division, Monday, Oct. 19, will discuss: Plasticity of Columbium Single Crystals; Plastic Deformation of Iron Between 300° and 77.2°K; Deformation of Ferrite Single Crystals; Plastic Stress-Strain Relations for 14S-T6 Subjected to Combined Tension and Torsion; Revealing the Subgrain Structure of Aluminum; Grain Boundary Attack on Aluminum in Hydrochloric Acid and Sodium Hydroxide; Microscopical Examination of Tin Bronzes in the Alpha Range; Identification of the Precipitate Accompanying 885°F Embrittlement in Chromium Steels; Measurement of Particle Sizes in Opaque Bodies; Measurement of Approximately Cylindrical Particles of Opaque Samples; Plastic Deformation of Single Crystals of Copper; Orientation Relationships in the Recrystallization of Deformed Copper Single Crystals; Plastic Deformation of Rectangular Zinc Monocrystals; Variation of Plastic Properties with Annealing Procedure in Zinc Single Crystals; Recovery in Single Crystals of Zinc; Some Observations on the Work Hardening of Metals; Some Applications of the Thermodynamic

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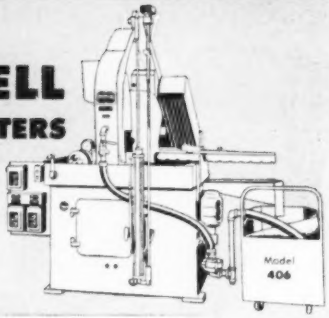

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On Tuesday, Oct. 20: Silver-Cadmium Eutectoid; Diffusionless Phase Change in the Indium Thallium System; On the Theory of the Formation of Martensite; Rate of Propagation of Martensite; Rate of Formation of Isothermal Martensite in Fe-Ni-Mn Alloy; Calculation of Martensite Nucleus Energy Using The Reaction-

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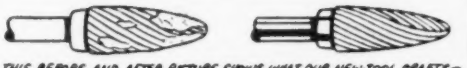

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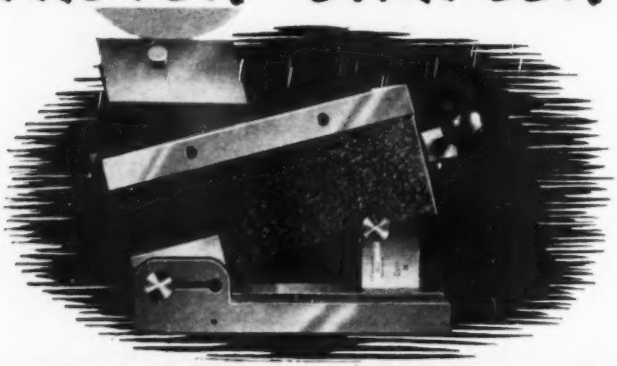

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On Wednesday, Oct. 21: Deformation Mechanisms in Alpha Titanium; Cold Rolled Texture of Titanium; Effects of Solid Solution Alloying on the Cold-Rolled Texture of Titanium; Textures of Rolled and Annealed Iodide Zirconium; Effects of Macrostructure on the Performance of Alnico Permanent Magnets; Densification and Kinetics of Grain Growth During the Sintering of Chromium Carbide; Influence of Aluminum and Silicon Deoxidation on the Strain Aging of Low-Carbon Steels; Age Softening of Beta Brass; Anelastic Behavior of Pure

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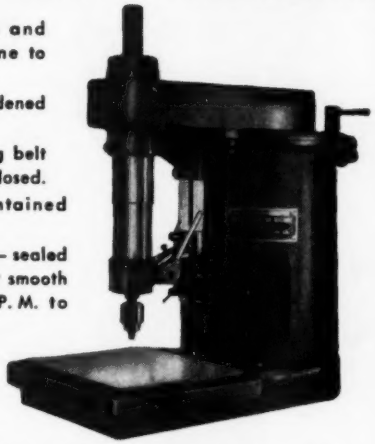

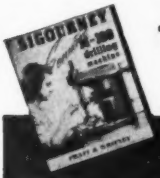

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Gold Wire; Some Properties of Columbium Containing Nitrogen; Electrical Resistivity of Liquid Metals and of Dilute Liquid Metallic Solutions.

American Welding Society technical papers, for Monday, Oct. 19, include: Aspects of Welding Research in British Merchant Shipbuilding; The Arcair Process; Shielded Metal-Arc Cutting and Grooving; Advanced Automatic Flame Cutting for Machinery Weldments; Radiography of Spot Welds; Resistance Welding in Jet Engine Manufacturing; A Study of the Cooling Rates in Flash Welds in Steel; Some Applications of High-Speed Motion Picture Photography to Resistance Welding.

On Tuesday, Oct. 20: Effect of Various Heat Treatments on Modified 347 Weld Deposits; Silver Brazing Alloys for Corrosion-Resistant Joints in Stainless Steels; Submerged Arc Welding of Chromium Bearing Steels; Tension, Shear and Impact Strengths of Spot-Welded Titanium Joints; Fusion Welding Commercially Pure Titanium; Alloy Filler Metals in Commercially Pure Titanium; Residual Stress and Inelastic Bending of WF Col-

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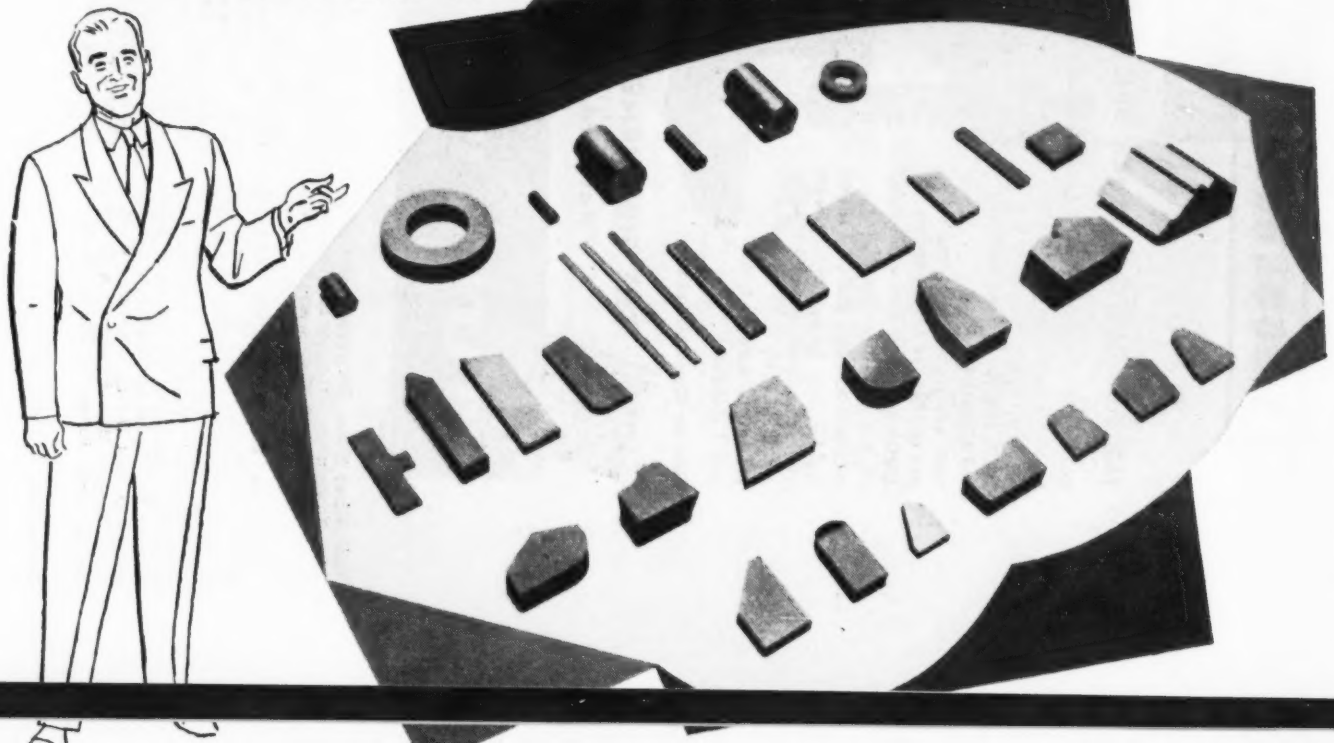

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umns; Weldability of Structural Steel Discussed from the Viewpoint of Federal Agencies; Development of Welded Bridge Construction; Recent Applications of Welded Design to Industrial Building Framings; Soldering of Aluminum; Fatigue Strength of Welded Butt Joints in 3/8-in. Thick Aluminum Alloy Plates; Some Considerations on Weldability of Aluminum Alloys; Cracking in High-Temperature Alloys as Related to Microstructure; Ductility Transition Characteristics of Weld Metal; Further Studies on Weld-Metal Microcracking in Mild Steel.

On Wednesday Morning, Oct. 21: Army First Pass Groove Weld Crack Susceptibility Test; Low-Temperature Bend-Test Properties of Bead-on-Plate Welds; Fatigue Properties of Weld Metal; A Study of the Weld Heat-Affected Zones in Titanium Alloys; Welding Characteristics of Titanium and Titanium Alloys; Study of the Effects of Alloying Elements on the Weldability of Titanium Sheet; Inspection Techniques for Quality Weld-

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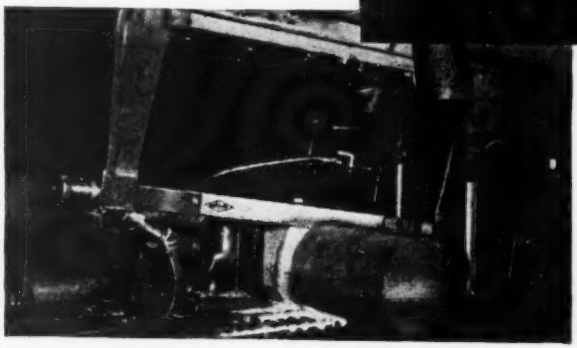

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ing Production; Nondestructive Testing as an Aid to the Increased Use of Welding for Steel Structures; Tolerances on Fillet Welds; Further Studies of the Arc Welding of Low-Chromium Molybdenum Steel Pipe; Superheaters for 1100° to 1500° F Test Installation; Carbide Segregation and Decarburization at Welded Joints; Welding Metallurgy of Nodular Cast Iron; The Effect of Low-Temperature Stress Relieving on Stress-Corrosion Cracking of Mild Steel; Transformation of Cr-Mo Steels During Welding; Multiple Contact Resistance; Teaching Engineering Fundamentals; Teaching Welding Design.

On Thursday, Oct. 22: Plastic Fatigue Strength of Pressure Vessel Steels; A Qualitative Study of Residual Stresses in Welds by Photo-elasticity; Effect of Nitrogen and Carbon Dioxide Atmospheres on Arc Welding; Biaxial Fatigue Properties of Pressure-Vessel Steels; Inert-Gas Shielded Metal-Arc Welding of Low-Carbon Steels; Characteristics of Consumable-Electrode Inert Arcs; Effect of Power Supply Characteristics on Sigma Welding; Weld Properties of a Carbon-Steel Electrode for Use with Inert

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Gas Shields; New Developments in Fluxes for Automatic Welding and Hard Surfacing; Multiple Electrode Welding by the Unionmelt Process; Multiple-Arc Submerged Arc Welding.

On Friday Oct. 23: New Welding Shop Facilities, Methods and Equipment at the Whiting Refinery; Silver and Gold for Brazing Electronic Components. New Results in Tool and Die Welding; Austenitic Manganese Steel Welding Electrodes; A New Method to Prevent Rectification of Current and High-Frequency Interference in Inert-Gas Arc Welding; New Developments in Sigma Welding of Carbon Steel; Porosity in the Welding of Carbon Steel; Scale Effects in Notch Brittleness; Effect of Subcritical Heat Treatment on the Transition Temperature of a Ship Plate Steel; Welded Mexican Bridge.

The Special Libraries Association will feature: Field trip to Battelle Memorial Institute, Columbus, Ohio, to inspect library and research facilities of the Institute, Wednesday, Oct. 21.

On Thursday, Oct. 22: Metal Fabrication. Methods and Literature; Modern Methods for Joining Metals; Abstracting

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and Indexing Sources for Literature on Metals and Metal Fabrication; Services Available From Large Libraries; Fundamentals of the Newer Metals; Materials for Use at Elevated Temperatures; Metallic Materials for Nuclear Reactors; Methods for Improvement of Reading Speed and Efficiency, as Developed at Case Institute of Technology.

On Friday, Oct. 23: Technical Session; Operations Research as a Metallurgical Tool; Techniques in Report Writing.

An A.S.M. seminar Oct. 17 on "Relation of Properties to Microstructure" will be held at the Hotel Statler. Subjects will include: Structure and Structure Sensitive Properties; The Effect of Grain Boundaries on Mechanical Properties; Principles of Solution Hardening; Effect of Dispersion on Mechanical Properties; Theory of Dispersion Hardening; Structure and Alloy Design; The Interaction of Dislocations With Solute Atoms.

On Oct. 18: The Relation of Fracture to Microstructure; The Strength of Glass Reinforced Structures; The Relation of Corrosion to Microstructure; Theory of

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the Relation of Magnetic Properties to Microstructure; Structure and Coercivity.

ASM educational lectures will be delivered in ballroom, public auditorium. These will include:

On Monday, Oct. 19, 4:30 P.M.: Technique Selection; Electroplates and Anodizing; Case Hardening, Diffusion coatings, and Selective Heat Treatment; Metal Spraying, by Howard Vanderpool.

On Monday, Oct. 19, 8:00 P.M.: Hard Facing and Abrasion Resistant Alloys; Practical Examples of Surface Protection; Summary and Discussion.

On Tuesday, Oct. 20, 4:30 P.M.: Economic Factors of Atmospheric Corrosion Versus Protection; Surface Preparation and Pretreatment of Metals Prior to Painting Organic Coatings for normal service; Organic Coatings for Severe Service.

On Tuesday, Oct. 20, 8:00 P.M.: Specifications for the Painting of Metals; Cathodic Protection and Galvanizing; Metallizing, by H. S. Ingham; Electrodeposited Coatings.

On Wednesday, Oct. 21, 4:30 P.M.: Basic Concepts of Fatigue Damage in Metals; Fatigue Failure Under Resonant Vibration Conditions.

On Wednesday, Oct. 21, 8:00 P.M.: Fatigue Characteristics of Large Sections.

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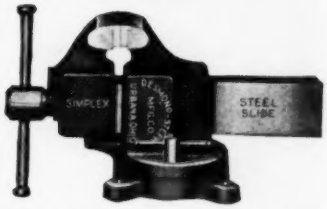

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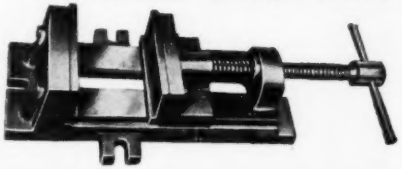

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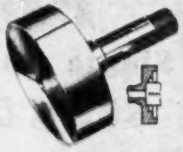

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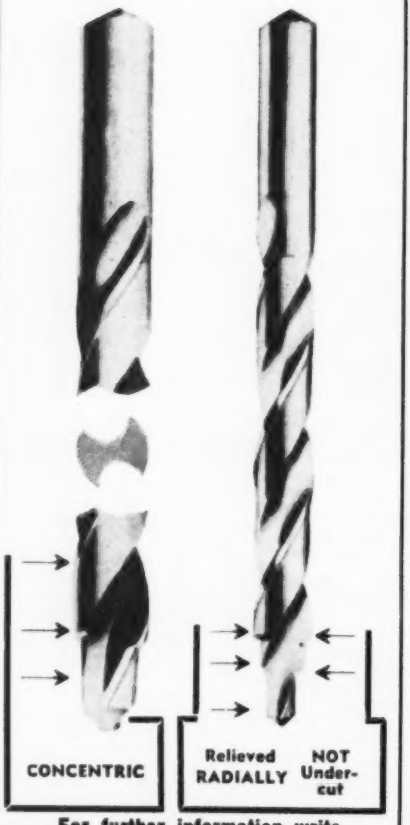

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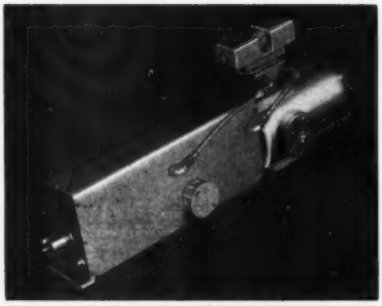

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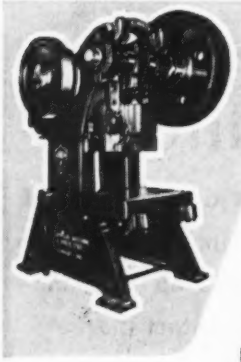

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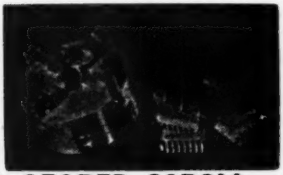

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30	4"	6½	30.00
30A	5"	11¾	37.50
31	6"	17¼	45.00
52	7½"	29	57.50
53	9"	43	67.50
54	10½"	62	95.00
55	12"	88	125.00

Universal Four Jaw, Two Sets of Jaws, Two Pinions

Model	Size	Wt. lbs.	Price
29Y	3¼"	3¾	$30.00
30Y	4"	7	37.50
30AY	5"	12½	43.50
31Y	6"	18¼	52.50
52Y	7½"	29	85.00
53Y	9"	42	95.00
54Y	10½"	62	110.00
55Y	12"	88	150.00

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Nickel Steel Operating Screws, Semi-Steel Body, Four Jaw Reversible, Hard Steel Jaws.

LIGHT

Model	Size	Wt. lbs.	Price
35A	3¼"	2¾	$12.50
35B	4"	4	14.00
35C	4½"	5	18.50
36	5"	7½	21.50
34	6"	10	22.50
37	8"	18¼	34.50

HEAVY

40	8"	36	$49.50
41	10"	60	58.00
42	12"	85	69.00
43	14"	104	79.00
44	16"	138	91.00

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(Available only in factory-brazed lengths.)

The design of some band saw machines today does not allow full scope to the unusually high production potential of the new Capewell Technite High Speed Steel Band Saw Blade. Hence, to give complete value and protection to Capewell customers, all initial installations of this new blade will be made only after full application data has been studied and approved by Capewell field engineers. Each individual blade will carry its own serial number for identification. Write Capewell Today.

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Webber Appliance Co., Inc.
Weldwire Company, Inc.
Wells Mfg. Corp.
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West Instrument Corporation
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Wheelco Instruments Div.
S. B. Whistler & Sons, Inc.
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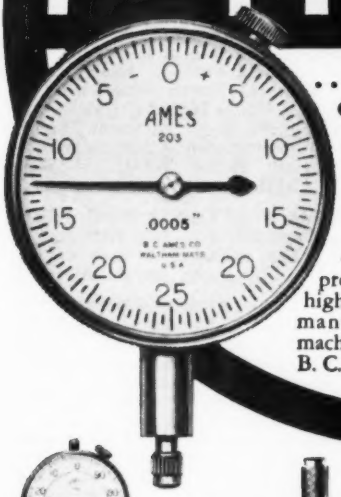
AMES



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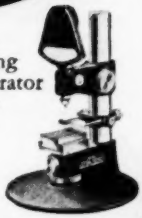

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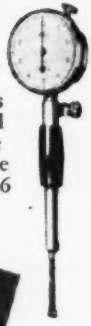

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AVAILABLE LITERATURE

FREE CATALOGS AND BULLETINS AVAILABLE FROM MANUFACTURERS

For copies of the literature in which you have an interest, use the postage-paid postcard on the next page. Merely circle the identifying numbers and mail the postcard before Dec. 31, 1953.

1. Tap selector This convenient pocket-size slide chart published by Threadwell Tap & Die Co., Dept. BB, Greenfield, Mass., brings basic tap information, within handy reach, and makes it easy to select and specify the correct drill and lubricant as well as the proper tap for each job; recommendations for drill size with decimal equivalent in both fractional and machine screw size taps with major pitch and root diameters and tap limits for various grinds, are included.

2. Rotary Tools. The Franklin Balmar Corp. N. A. Strand Div., Dept. BB, Woodberry, Baltimore 11, Md., has issued a new enlarged catalog of rotary tools for use with its line of Strand flexible shaft machines and the Diskette portable electric tool. It gives complete specifications for each tool and contains data on recommended cutting speeds.

3. Sheet Metal Fabricator. Catalog 10-AA (1st edition) describes and illustrates the sheet metal fabricator of the Wales-Strippit Corp., Dept. BB, 345 Payne Ave., North Tonawanda, N.Y., for punching, notching and nibbling up to 165 strokes a minute. Features of the fabricator are said to be rapid interchangeability and speedy, accurate setup.

4. Gaging Cartridges. A 24-page booklet illustrating and describing applications of Plunjet gaging cartridges have been published by the Sheffield Corp., Dept. BB, Dayton 1, Ohio. This product may be used in conjunction with column and dial type gages.

5. Locknuts. Eight-page folder of Security Locknut Corp., Dept. BB, North and 15th Aves., Melrose Park, Ill., gives applications, illustrations, descriptions, and specifications of Locknuts and Studlocs.

6. Files. Seven catalogs of Heller Brothers Co., Dept. BB, Newcomerstown, Ohio, list their complete line of files and tools. Titles of booklets are: (1) Heller Swiss Pattern Files; (2) Nucut American Pattern Files; (3) Vixen Milled Curved Tooth Files; (4) American-Swiss Swiss Pattern Files; (5) American-Swiss American Pattern Files; (6) Heller Tools; (7) Full-Line File Catalog.

7. Perishable Metal Cutting Tools. Falcon Tool Co., Dept. BB, P.O. Box 4605, Detroit 34, Mich., has released a new catalog covering their products, perishable metal cutting tools.

8. Power Tools. A 52-page catalog (No. 53) of power tools, for cutting, shaping, drilling and finishing wood, metal, fiber and plastics, has been released by Boice-Crane Co., 936 Central Ave., Toledo 6, Ohio. Gives descriptions of band saws, contour saws, band filers, drill presses, tool and knife grinders, jig saws, jointers, lathes, planers, etc.

9. Small-Motor Service Station Plan. A four-page bulletin (GEC-972) describing a new motor service plan for fractional- and integral-hp motors and generators is available from General Electric Co., Dept. BB, Schenectady 5, N.Y. Explains types of service provided, service warranties, motors covered by the plan, etc.

10. Alco Tools. Complete listing of products is contained in Catalog No. 9 of the Alco Tool Co., Dept. BB, Bridgeport 4, Conn. Featured are: bushing type holders; cams; cut-off blades; carbide; cut-off tools, h.s.s.; cutting speeds; decimal equivalents and drill sizes; die holders—non-releasing type; die holders—releasing type.

11. Arcwelding Machines. Over 20 different models of arc welding machines are described in Catalog 1340 of Air Reduction Sales Co., Dept. BB, 60 E. 42nd St., New York 17, N.Y. Inert-gas, a.c. and d.c. models are illustrated; and specifications, features, and electrical data are given.

12. Induction Heating Equipment. Thirty-six-page booklet of Lepel High Frequency Laboratories, Inc., Dept. BB, 55th St. and 37th Ave., Woodside 77, New York, N.Y., discusses heat treating, metal joining, bombarding, and melting. Partial list of contents includes: principles of induction heating; practical application of induction heating; brazing carbide cutting tips.

13. Punch Presses. Diamond Machine Tool Co., Dept. BB, Pico, Calif., has released a booklet on their line of open back inclinable punch presses. It contains sections on calculation of press capacity; specifications; construction features; testing methods; and frame, bed and ram dimensions.

14. Clutch Control. Micro Switch, a division of Minneapolis-Honeywell Regulator Co., Dept. BB, Freeport, Ill., has offered Catalog No. 59, on Microtrip, an electric clutch control for power machines. Factors claimed for this control are light-touch actuation, instantaneous electrical response, and simple operating motions.

15. Drilling Machines. Buffalo Forge Co., Dept. BB, Buffalo, N.Y., in Bulletin 3123-E, details and illustrates their No. 18 line of drilling machines. The No. 18 is available in nineteen models, to complement any arrangement of table, feed, etc.

16. Pulley and Clutch. Brochure describing their new automatic variable pitch and clutch is available from the Hoover Pulley Co., Dept. BB, Williamstown, Mass. Development is said to be particularly advantageous on low starting torque split phase motors; makes use of the centrifugal force of a revolving ball column.

17. Gaging Equipment. Bulletins on the Indi-Ac electronic indicator, Par-Ac electronic production gage, and Micro-Ac electronic micro-comparator are announced by Cleveland Instrument Co., Dept. BB, 735 Carnegie Ave., Cleveland 15, Ohio. They define the fields of application of each instrument, show the equipment in use, and describe each unit.

18. Cone-Drive Gears. The extent to which double-enveloping worm gearing has helped improve design, performance, service-life and salability of all types of equipment is illustrated in a 36-page booklet now available from Cone-Drive Gears Div., Dept. BB, Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. Bulletin CD-173, titled "Cone-Drive Gears At Work In Industry," documents 93 applications in 20 different industrial classifications.

19. Abrasive Belt Splicer. Description of the operation of the Econoway abrasive belt splicer, together with specifications and prices, is contained in Bulletin 310 issued by Aget-Detroit Co., 205 Main St., Ann Arbor, Mich. Leaflet has illustrations of the simplified method for making up joined belts from paper or cloth backed abrasive in roll form.

20. Crucible Furnaces. In Bulletin No. C-2, issued by the Eclipse Fuel Eng. Co., Dept. BB, Rockford, Ill., and Toronto, Ontario, Can., the various models of the company's gas-fired crucible furnaces for melting nonferrous metals are illustrated and described. Complete specifications and details are given. Information on gas combustion equipment is also included.

21. Materials Handling. "Improving Materials Handling in Small Plants" is on sale for 20c by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. Booklet deals with movement of raw materials, parts-in-process, and finished products, and includes both manual and mechanized operations.

22. Improving Metal Cutting. A 28-page, pocket-size booklet, "Metal Cutting," is offered by Clemson Bros., Dept. BB, Middletown, N.Y. Included are rules for selecting and using hack saw blades and frames, right and wrong way to saw a piece of metal, table describing the causes and cures for blade trouble, section on how to select and use power hack saw blades, etc.

23. Electronic Timers. Bulletin No. 315-10 of Sciaky Bros., Inc., Dept. BB, 4915 W. 67th St., Chicago, Ill., covers their electronic timer for short interval control of mechanical and electrical operations. Specifications are given for five of the most widely used models.

24. Cutting-Off Blades. Circular No. 561, published by Pratt & Whitney, Dept. BB, West Hartford 1, Conn., catalogs and illustrates the firm's cutting-off blades and holders, including blades with taper, without taper, and special designs. Tables of sizes are given.

25. Industrial Filtration. Bulletin A-943 from U. S. Hoffman Machinery Corp., Industrial Filtration Div., Dept. BB, Thompson Rd., Syracuse 7, N.Y., graphically presents the essential features and applications of their ten basic types of

THIS HELPFUL LITERATURE NOW AVAILABLE

industrial filtration equipment. These include disc, cartridge, and pressure type filters; flotation units; vacuum stills; magnetic separators; and oil conditioners.

26. Milling Cutters. Goddard & Goddard Co., Dept. BB, Detroit 23, Mich., has made available a 52-page descriptive catalog (No. 2) containing their standard solid high speed steel milling cutters and end mill holders. Covers a recent addition of 147 different sizes to their standard end mill line.

27. Pressroom Equipment. Sixteen page catalog of Durant Tool Supply Co., Dept. BB, 155 Orange St., Providence 3, R.I. includes their new and enlarged lines of slide feeds, press guards and stock straighteners.

28. "Rockwell Lubricants for Nordstrom Valves." Comprehensive 12-page bulletin V-220, issued by Rockwell Mfg. Co., Dept. BB, 400 N. Lexington Ave., Pittsburgh 8, Pa., describes lubricants, lubricant fittings and lubrication methods for Rockwell-built Nordstrom valves.

29. Turret Lathes. Bulletin No. 151 will be sent by Potter & Johnston Co., Dept. BB, Newport Ave., Pawtucket, R.I. It covers the 3-U automotive turret lathe—for small, precision parts, multiple machining operation, high speed production. Requests should be addressed to J. Potter Cunningham. Bulletin No. 145 explains the Model 3U Speed-Flex turret lathe.

30. English Imports. Illustrated bulletin of DeWitt Equipment Co., Dept. BB, 136 Lafayette St., New York 13, N.Y., gives complete specifications of heavy duty swivel angle plates, rotary swivel angle tables, universal adjustable precision angle tables and multiangles jigs.

31. Press Brake Forming Dies. The Rafter Machine Co., Dept. BB, Belleville 9, N.J., announces that they have a bulletin outlining press brake forming dies of their manufacture.

32. Double Spindle Grinders. A 28-page catalog illustrating and describing their full line of precision double spindle grinders has been published by Gardner Machine Co., Dept. BB, Beloit, Wis. It includes several redesigned models and 16 types of work carrying fixtures which can be adapted to these machines.

33. Glass Textiles for Industry. A 32-page pamphlet published by Hess, Goldsmith & Co., Inc., Dept. BB, 1400 Broadway, New York 18, N.Y., lists 19 industries and fields in which glass textiles are finding increasing production use. The booklet, "Glass Textiles for Industry," discusses three basic fiber glass textile forms and contains charts illustrating end uses of these forms.

34. Screwdriving Tools. A 60-page catalog containing specifications, prices and illustrations on production screwdriving tools has been issued by the Apex Machine & Tool Co., Dept. BB, Dayton 2, Ohio. Catalog 21 lists their complete line of bit holders and insert bits, power bits, hand drivers, offset drivers and finder sleeve assemblies.

35. Fire Pumps. Ingersoll-Rand Co., Dept. BB, 11 Broadway, New York 4, N.Y., has made available a 4-page descriptive bulletin on its line of horizontal, single-stage and vertical, multi-stage fire pumps for permanent installation in fire protection systems of the hose line or sprinkler type.

36. Glass-bonded Mica. A comprehensive 23-page, illustrated reference and operation manual on the machining of glass-bonded mica has been issued by Mycalex Corp. of America, Dept. BB, Clifton, N.J. Based on actual plant experience at the company, "From One Machinist to Another" is written in the language of the machinist.

37. Bearings, Bronze Bars. Catalog No. 152, Bunting Brass & Bronze Co., Dept. BB, Toledo 1, Ohio, contains complete listings of industrial standard stock bearings, bars and electric motor bearings.

38. Inside Adjustable Gages. Barnaby Mfg. Co., Inc., Dept. BB, 74 Knowlton St., Bridgeport, Conn., have released a booklet illustrating their inside adjustable gages, for use in inspection of inside diameters and checking bell-mouth and out-of-roundness. Also explained is the Barnaby speed gage, originally developed to facilitate production gaging in war industries.

39. Beryllium and its Alloys. Beryllium products, including the pure metal, oxide and alloys, are described in the Berylco product directory, a 20-page booklet published by the Beryllium Corp., Dept. BB, Reading, Pa.

40. Disc Grinders. The double spindle disc grinders—for finishing opposite faces flat and parallel simultaneously—of the Mattison Machine Works, Dept. BB, Rockford, Ill., are portrayed in Bulletin No. 647-2RM. Applications, feeds, features and specifications are discussed.

41. Precision Cylindrical Grinder. A 24-page catalog (K-53) describes the 12"x28" universal and tool grinder of the Landis Tool Co., Dept. BB, Waynesboro, Pa. Fifty-two photos illustrate the machine, operating features, equipment and typical grinding operations.

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42. Cemented Carbides. "Kennametal Cemented Carbides" gives essential technical data on Kennametal and Kentanium, including mechanical and physical properties. Request Publication C-53 Kennametal Inc., Dept. BB, Latrobe, Pa. New prices of Kennamatic inserts & holders are given in Supplement 3 to Catalog 52.

43. Adjustable Speed Drives. Bulletin of the Rogers Machine Works, Inc., Dept. BB, Alfred, N.Y., illustrates and describes the adjustable speed drive on Rogers' "Perfect 36" vertical turret mills. Drive is said to provide unlimited table chuck speeds up to 212 r.p.m.

44. Air Valves. Catalog No. 53 of Mechanical Air Controls, Inc., Dept. BB, 15311 W. 11 Mile Rd., Detroit 37, Mich., gives complete data and description of the company's products—valves for the control of single and double acting air cylinders. Booklet is designed to lie flat while in use.

45. Machine Tools and Gages. "How DoAll Products are Made, Sold and Serviced" and "What Users Say about DoAll Gages" are two booklets issued by the DoAll Co., Dept. BB, 254 N. Laurel Ave., Des Plaines, Ill. The former presents a bird's-eye view of the DoAll organization. The latter publication contains excerpts of letters from users of the company's products.

46. Standard Thread Gages. Prices and tolerances of gages made by Detroit Tap and Tool Co., Dept. BB, 8615 E. 8 Mile Rd., Base Line, Mich., are listed in Bulring gages and thread setting plug gages for machine screw and fractional thread sizes are included. Types and uses of thread setting plug gages are discussed and tables listing W, X and Y tolerances for thread gages up to and including 1½" are incorporated in the booklet.

47. Line-conditioning. The production line welder rebuilding plan of Lincoln Electric Co., Dept. BB, Cleveland 17, Ohio, is explained in Bulletin 480. Discussed in detail are welder disassembly, radiator reconditioning, sheet metal reconditioning, control box rebuilding, armature reconditioning, engine rebuilding, etc. A new edition of the company's Weldirectory 466, covering hardsurfacing, is also available.

48. Screw Thread Manufacturing. Model PR ring-snap thread gage and Model BG-CN comparator are illustrated and discussed in a leaflet of the Johnson Gage Co., Dept. BB, Bloomfield, Conn. Some of the firm's developments that have been adopted or standardized by industry are enumerated.

49. Thread Rolling. The Prutton Rollmaster Model 200, said to save 65% of thread rolling costs, is feature in Bulletin No. 200/A, D. H. Prutton Machinery Co., Dept. BB, 5295 W. 130th St., Cleveland 11, Ohio. Parts are numbered and described in detail.

50. Cutting oils and water soluble compounds made by Fiske Bros. Refining Co., Dept. BB, 129 Lockwood St., Newark 5, N.J., are fully described in brochures, along with tables and helpful suggestions, just released. These include: Darl cutting oil, cutting oils for aluminum, magic compound—a paste for dilution with water, and die cutting compounds.

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51. Millers, Grinders. More work per man hours is claimed by the Van Norman Co., Dept. BB, Springfield 7, Mass., through use of their ram and horizontal knee millers and their production, spline, and oscillating grinders. Bulletin 2/Va pictures them and gives specifications of each.

52. Electronic Control. "Cutting Production Costs with Electronic Controls" is a complete revision of the handbook published by Photoswitch Inc., Dept. BB, 77 Broadway, Cambridge 42, Mass. Forty-six new case studies explain how standard packaged electronic controls have solved problems of weighing, counting, measuring, timing and cycling.

53. Speed Control Valves. Bulletin 305, Ross Operating Valve Co., Dept. BB, 120 E. Golden Gate Ave., Detroit 3, Mich., features speed control valves made by Ross. Leaflet tells how they work, lists properties and available models, and includes installation data and a parts list.

54. Jig and Fixture Details. Twenty-six-page catalog published by Harco Engineering, Dept. BB, 12092 Woodbine Ave., Detroit 28, Mich., features most commonly used fixture details, including rest buttons, fixture keys, swivel screws, dog point screws, etc. Full scale dimensional drawings are furnished for most items.

55. Steel Slide Vises. Catalog 60 of the Desmond-Stephan Mfg. Co., Dept. BB, Urbana, Ohio, contains information on the various types of vises manufactured by the company. Included are: machinists' stationary base, swivel base, swivel base and jaw; combination bench and pipe; sheet metal or pattern makers'; filers' swivel base; hinged pipe; woodworkers' wood handle, steel handle; utility. Also available is Cat. Sheet No. V-20, containing prices as of April 7, 1953.

56. Grant Gear Works Inc., Dept. BB, Boston 27, Mass., has just issued a very comprehensive catalog with useful engineering data relative to gears. Stock gears, speed reducers and special gears are included; 176 pages.

57. Slide Chart. A slide chart giving the basic tolerances for spline plug and ring gages having p.d.'s up to 8" is offered by Vinco, Dept. BB, 8855 Schafer Hwy. Detroit 27, Mich. Helpful in designing or inspecting spline gages. Included are explanatory notes concerning tooth thickness parallelism, concentricity and major and minor diameter tolerances.

58. Lubricator. The Travels of Modern Lubrication, Bulletin NB-11, published by Bijur Lubricating Corp., Dept. BB, Rochelle Park, N.J., illustrates and describes applications of their solenoid-operated lubricator. Bijur engineers are said to be available to industry for solving lubrication problems of machines now in production or in the planning stage.

59. Measuring Surface Roughness. An 8-page illustrated bulletin (LT77) on the Profilometer for measuring surface roughness is announced by Micrometrical Mfg. Co., Dept. BB, 345 S. Main St., Ann Arbor, Mich. Entitled "Practical Features and Applications of the Profilometer," booklet describes seven ways in which the Profilometer is used for production and quality control, and shows typical applications.

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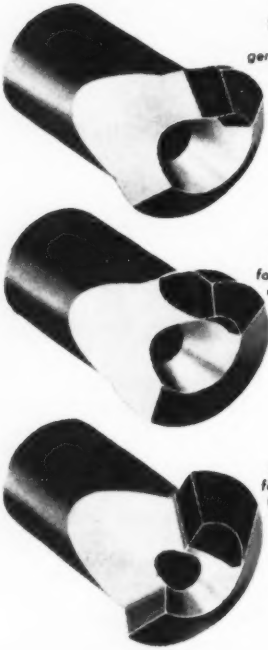

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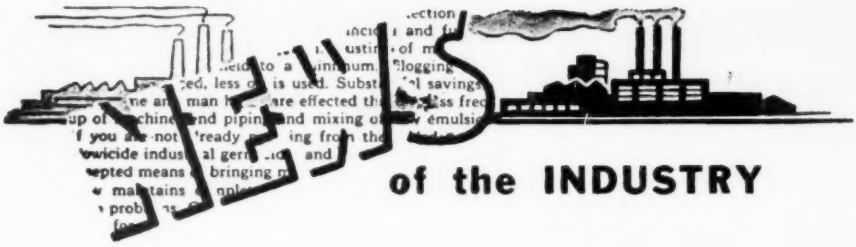


of the INDUSTRY

Cyril Bath Opens Two Million Dollar Plant

THE NEW two million dollar Cyril Bath Company plant, architecturally designed to foster the "family craftsman theme" in American production, held its preview opening August 14 and 15.

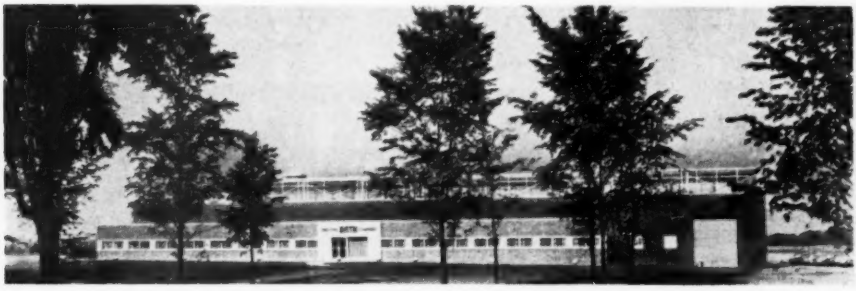
Designed to make the most effective use of space and light, the company's new plant is located on Aurora Road, Solon, Ohio, about 20 miles southeast of Cleveland. According to Cyril J. Bath, president of the company, "The lighting and appearance of the plant is in accordance with an artist's approach to his craft, for the people who make machine tools are artisans."

Comprising 50,000 square feet, the new structure takes up only one-fourth of the 18 acres purchased by the company. Twelve acres of the site are being landscaped and some will be made into an employee recreational area. The plant is located 200 feet back from Ohio Route 43 to allow for trees and lawn.

Designed and engineered by the architectural firm of Dalton & Dalton Associates, the new plant incorporates many modern concepts of industrial architecture. The one-floor steel frame building houses factory, general and executive offices. The windows are horizontal "vision strips", admitting daylight with a minimum of sun glare; fluorescent lighting supplements natural lighting throughout the building.

The factory area has been carefully laid out by the architects to facilitate an orderly flow of material and operations. Eight overhead rail cranes handle up to 25 ton loads. Special rail facilities were installed for the plant by the Nickel Plate Railroad. This railroad spur runs directly into the plant, so freight cars can be loaded or unloaded by crane inside the building in any kind of weather. An outside storage area is similarly served by overhead rail crane.

Heating throughout the building is by hot water, unit heaters in the factory area and fin tube radiation in the offices, with air conditioning for summer comfort. The cafeteria and conference rooms are separately air conditioned.



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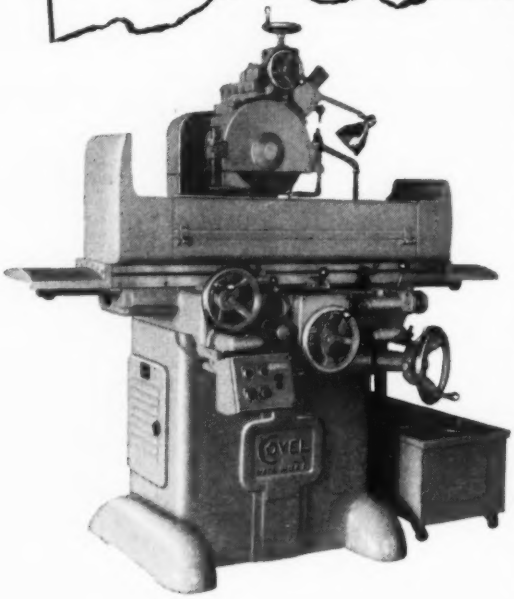
Manufacturing plant needs precision surface grinder capable of high speed for increased production. Qualifications must include: accuracy, flexibility of operation, easy and low-cost maintenance plus durability and long life. References of past experience must be furnished.



here's your answer

Covel Surface Grinders are fully qualified to meet these requirements and are ready to start working for you NOW. Covel has built precision grinders since 1874. Our thousands of satisfied users are your assurance of dependable service and top performance.

QUALIFYING FEATURES

Hydraulic Feed—low-pressure hydraulic system used throughout. Pilot valve gives smooth reversal at high speed. Table speed from 10 to 90 ft. per minute.

Sealed-for-life Spindle requires no lubrication—keeps out grit.

Grinding Wheel Truing Device mounted on vertical slide. Enables wheel to be dressed without removing work from chuck on production grinding. Saves valuable time.

Anti-Friction Ball or Roller Bearings used throughout.

Hard chrome table ways for extra long life.

Hardened and ground cross feed and elevating screws.

TWO SIZES:	No. 20	No. 35
Work capacity	6" x 18"	8" x 24"
Transverse table travel	6¾"	9"
Longitudinal table travel	20"	27"
Grinding wheel size	10"	12"
Capacity under wheel	12"	11"

Write for **BULLETIN MT-103**

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

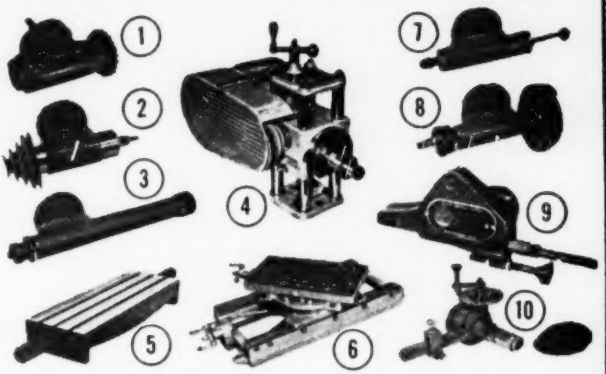
DRILL GRINDERS • UNIVERSAL CUTTERS & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

master
MACHINE TOOL ATTACHMENTS

for

LATHES
TURRETS
MILLS

OR USE INDEPENDENTLY



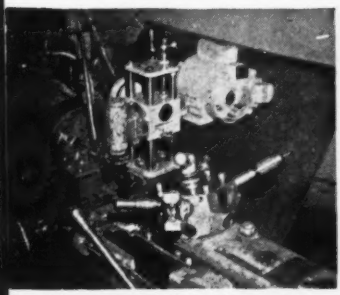
1. 90° Universal Milling Head
2. Hi-Speed Milling and Drilling Head
3. Deep-Hole Internal Grinder Head
4. Basic Milling Unit
5. Milling and Grinding Table
6. Universal Feed Table
7. Internal Grinder Head
8. External Grinder Head
9. Slotting and Keyseating Head
10. Geared Dividing Head

THREE SIZES

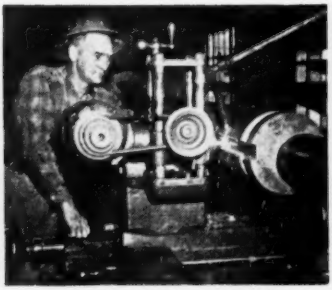
MODEL "C," ⅓ hp—9" to 13" LATHES
MODEL "B," ½ or ¾ hp—13" to 18" LATHES
MODEL "M," 1 to 3 hp—18" to 72" LATHES

The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, internal and external. Its full complement of equipment is an outstanding value for maintenance, repair, tool room, and experimental shops, as well as production, thus performs a full range of shop operations at a minimum investment. These improved models are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our 17 years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

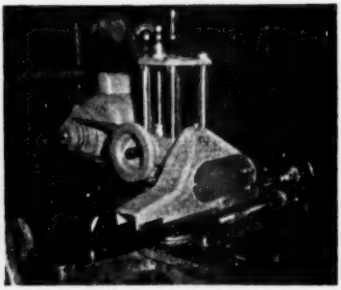
MAKES LOW-COST INDEPENDENT PRODUCTION SET-UPS — PORTABLE — SELF-POWERED



Milling on turret lathe completing part in one set-up



End Milling 2½" keyway in 9⅞" diameter shaft 22 ft. long



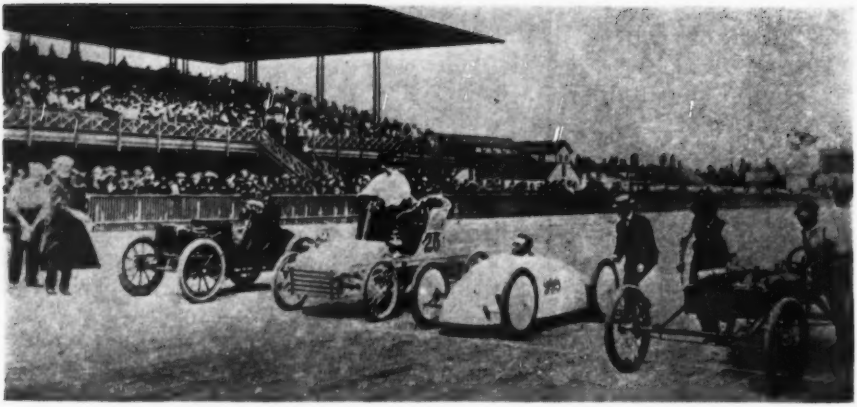
Master Slotting Head on lathe cutting internal taper keyway

FREE

WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

MASTER MANUFACTURING CO.

1302 EAST AVENUE A • HUTCHINSON, KANSAS, U.S.A.



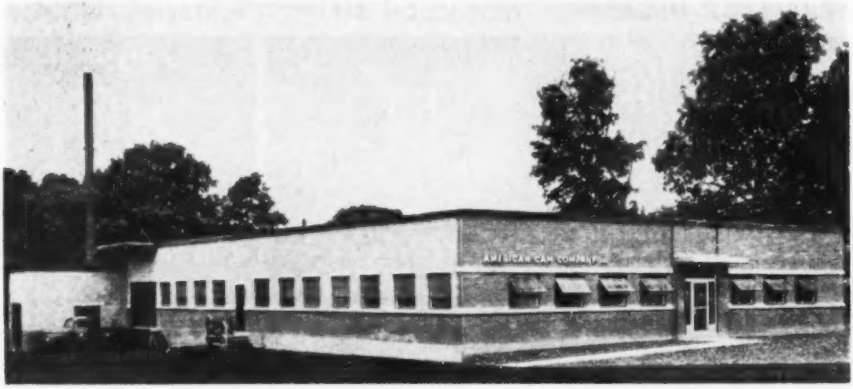
The Baker-Raulang Co., 1230 W. 80th St., Cleveland 2, Ohio, pioneer materials handling firm, celebrates its 100th anniversary this year. Threading back through this century of Baker history is the closely paralleled story of America's progress. For instance, in 1902 when a 20 m.p.h. spin was a breathtaking adventure, Walter Baker turned up at a Long Island speed trial with his electric "torpedo" and astounded the nation with a top speed that was officially clocked at 104 m.p.h.; top speed was believed 132 m.p.h. The car was packed with batteries and operated by two men. Baker piloted while an assistant, lying prone, worked the resistor banks to control the car's speed. That same year Baker developed the first drive shaft and rear axle bevel gear for autos, an innovation which increased automobile drive efficiency tremendously and did a great deal to popularize the auto.

American Cam moves to Bloomfield, Conn.

The American Cam has just completed transferral to its new quarters at Bloomfield, Conn. The mailing address will remain Hartford 1, Conn.

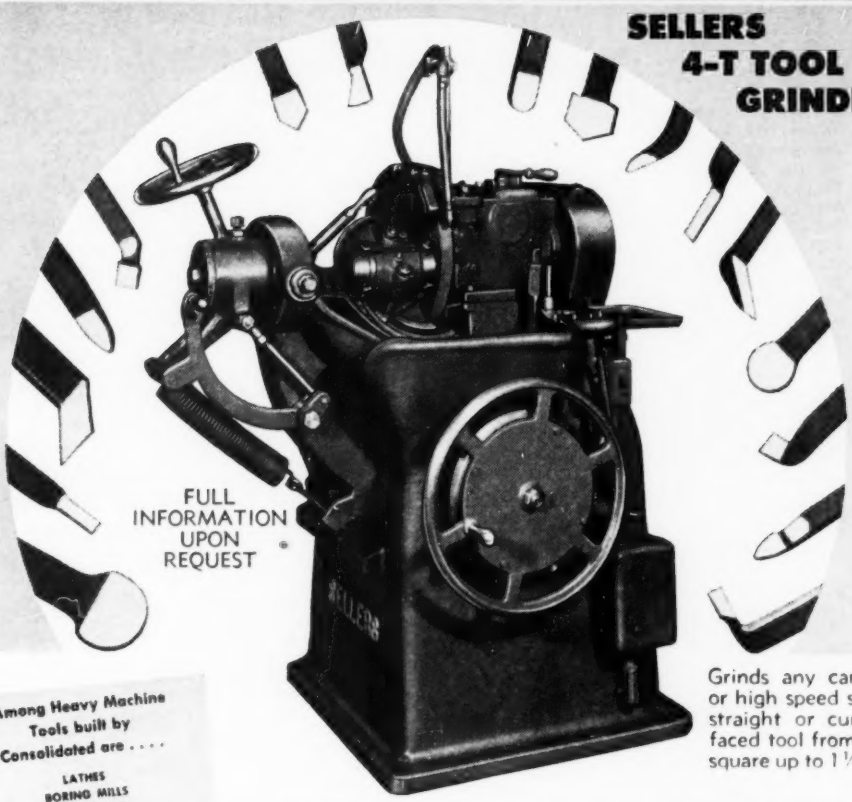
The recently completed building will house the company's general offices, drafting room, and inspection department in addition to increasing manufacturing space.

George Chase ,president, in announcing



BETTER TOOL GRINDING
MEANS LOWER PRODUCTION COSTS

SELLERS 4-T TOOL GRINDER



FULL INFORMATION UPON REQUEST

Grinds any carbide or high speed steel, straight or curved, faced tool from ¼" square up to 1½x2"

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

The grinding precision and uniformity of Sellers Tool Grinders are the result of the Sellers Line Contact Principle of grinding, accomplished by moving the work up and down in a straight line tangent to the periphery of the grinding wheel, in this way allowing the work to contact the wheel along a line only. Proper rake and clearance angles at the cutting edge are quickly and economically obtained. The operation is so simple that a toolroom attendant can easily maintain tools for the entire shop.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

the move, pointed out that in addition to expanding facilities and employment approximately 20%, plant layout and work flow would be improved, resulting in an estimated production increase of 33%.

Additional production will be utilized to meet increased sales and also to broaden the company's line of cams, tools and accessories for automatic screw machines. Manufacture of special purpose cams and eccentric contours will be continued at the new plant.

United States Diamond in new plant

United States Diamond Wheel Co., announces the completion of its new Aurora, Ill. plant, 835 Illinois Ave. Constructed on a single-level plan, the functional building is designed of structural brick and glass, and is said to be one of the most modern in the entire diamond wheel industry.

Michigan Chrome in modern office

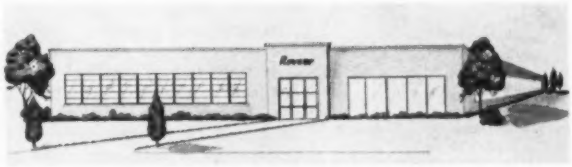
Michigan Chrome and Chemical Co., 8615 Grinnell Ave., Detroit 13, Mich., has just moved into its new, modern office located at that address.

The office, built in conjunction with their new plant, brings management, sales (both Chemical and Plating Divisions), accounting, and purchasing under one roof.

A total of 5,000 square feet of floor space is used for all the functions of the new office. Ample "off the street" parking is available.

Revcor moves to Carpentersville, Ill.

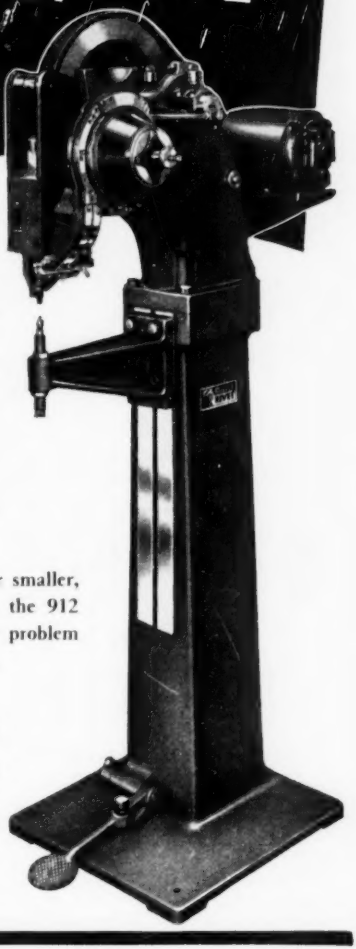
Revcor, engineers and manufacturers of blower wheels, have recently moved from 5203 North Avondale Ave., Chicago, Ill., to a large modern plant in Carpentersville, Ill. Their new plant gives them complete facilities for research, design and engineering and enables them to greatly increase their manufacturing volume.



Gairing acquires drill line

The Gairing Tool Co., Detroit 32, has acquired outright the line of interchangeable spade drills and core drills formerly made by Conner Tool & Cutter Co., Detroit, Mich. and Sullivan, Ind. The transaction includes trade name, manufacturing facilities and inventory.

Chicago RIVET "912" AUTOMATIC RIVET SETTER CUTS COSTS 3 WAYS



1 FASTENS FASTER . . .
Only the speed of the operator limits the 912's riveting speed. Completely automatic. A push on foot pedal automatically feeds, inserts and clinches the rivet.

2 DOES WORK OF SEVERAL MACHINES . . .
Quick change rotary hopper and raceway makes the 912 adjustable in 5 to 10 minutes to set different size rivets. Adjustable anvil height and 12-inch throat provide further versatility.

3 SAVES ON MAINTENANCE
The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.

If your assembly calls for 3/16" steel tubular rivets or smaller, of 15/16" lengths or less, ask us to show you how the 912 can cut your fastening costs. Send a sample of your problem assembly (or blueprint) for a free fastening analysis.

FREE CATALOG
contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

Chicago Rivet & MACHINE CO.

9610 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois

***Branch Factory:* Tyrone, Pa.**

automation
CIRCUITRY

works BEST with

POTTER & BRUMFIELD RELAYS

Heavy Power Relays

Shock-Proof Relays

Medium Power Relays

Telephone Relays

Also voltage actuated, current actuated, sensitive, hermetically sealed and plug-in types.

Build more flexible "working circuits" into your basic machinery control system with P & B relays for . . . Screw Machines • Boring • Drilling, Tapping • Honing Lathes • Hobbing Indexing • Hydraulic Interlock

Buy stock model P & B relays from your local Electronic Parts Distributor. P & B field engineers located in principal U. S. & Canadian cities.

Write for Bulletin 100 illustrating over 100 types of standard relays.

POTTER & BRUMFIELD

DEPT. MT • PRINCETON, INDIANA

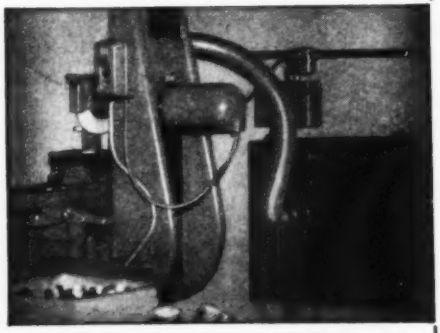
STOP DUSTS INSTANTLY

with

DUSTKOP

Available from stock of 22 standard models

300 cfm to 10,000 cfm



for: Surface Grinders, Tool and Cutter Grinders; Polishers and Buffers; Abrasive Belts and Discs; Woodworking and Plastic Industry Equipment . . . DUSTKOPS collect almost all kinds of industrial dusts.

Ask for Catalog 605-2. Describe dust problems for recommendation by return mail — no obligation.

AGET-DETROIT CO.

502 Main St. Ann Arbor, Michigan

SOUTH BEND MACHINE TOOLS

for Better, More Efficient Machining

Here are precision machine tools that consistently hold down machining costs while producing work of better quality. Return the coupon for catalogs in which you are interested.

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three Ways to Order

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

SEND CATALOGS CHECKED:

- ☐ 9" Lathes
- ☐ Light Ten Lathes
- ☐ 10" Lathes
- ☐ 13" Lathes
- ☐ 14½" Lathes
- ☐ 16" Lathes
- ☐ 16-24" Lathes
- ☐ Series 900 and 1000 (½" and 1" collet) Turret Lathes
- ☐ No. 2-H (1" collet) Turret Lathes
- ☐ Complete Lathe Catalog
- ☐ Attachments and Accessories — Lathes, Drill Presses, Shapers
- ☐ 14" Drill Presses
- ☐ 7" Bench Shapers
- ☐ Pedestal Grinders
- ☐ Training Aids and Films

$_____ enclosed for handbooks checked

- ☐ How to Run a Lathe — 50¢
- ☐ How to Run a Shaper — 25¢
- ☐ How to Run a Drill Press — 25¢

Name _____ Company _____

Street _____

City & Zone _____ State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

THERE'S A
Morton FIXTURE CLAMP and or COMPONENT TO FIT YOUR
MOST Exacting REQUIREMENTS
● ECONOMIZE . . . Use them as STANDARDS. Your tool stores should have a representative stock of all MORTON details.
● HIGHEST QUALITY of workmanship and materials maintained. Backed by over 30 years of fine tool making.
● IMMEDIATE DELIVERY on Standards. May be modified to suit your application.
Write for: Instructive illustrated Catalog containing full size templates of each product for tracing purposes.
Morton
4
MORTON MACHINE WORKS
2421 WOLCOTT STREET • DETROIT 20, MICHIGAN

Rectifier corporation opens Puerto Rican plant

Announcement was recently made that Rectifer Corp. of Puerto Rico has begun operations in a new plant located in Fajardo. The new company has been incorporated under the island's laws to manufacture selenium rectifiers and related electronic equipment.

Lloyd J. Hughlett, president of the new company, announced that the plants facilities have been organized to produce a complete line of radio stacks for radio and television receivers and comparable equipment requiring current conversation.

Terry Inc., represents B. C. Ames

Terry, Inc., 1426 M Street Northwest, Washington 5, D.C., are the exclusive representatives of B. C. Ames Co., Waltham, Mass. They will sell Ames micrometer dial gauges and micrometer dial indicators and offer engineering service in the following territory: Washington, D.C., western part of Maryland except Baltimore; Virginia; eastern section of West Virginia.

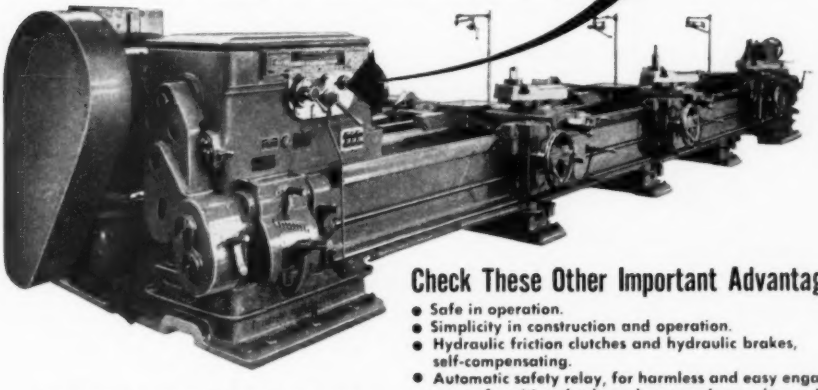
Just a "Twist of the Wrist" does it!

...The Lehmann HYDRATROL LATHE

gives 16 Spindle Speed changes with Automatic Slide Rule Selection.

Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The rotary handle provides all speed changes for 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.



Check These Other Important Advantages:

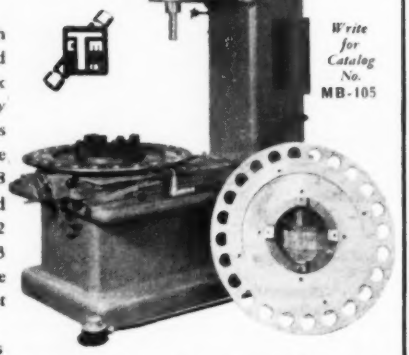
- Safe in operation.
- Simplicity in construction and operation.
- Hydraulic friction clutches and hydraulic brakes, self-compensating.
- Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.
- Spindle release for chucking.
- Perfect, safety-control lubrication with filtered oil.
- Gears constantly in mesh.

Write today for additional information or catalog — or — send prints for time-and-money-saving recommendation!

LEHMANN MACHINE COMPANY
GRAND AT CHOUTEAU • ST. LOUIS 3, MO.
DIVISION OF NOVO ENGINE CO.

78 Holes tapped in one piece -

Another Cleveland Design to Speed Production!



This Model E-2 with special column and special hand index table was designed by Cleveland to cut costs on a large jet engine part. 63 holes .250-28 and .375-24 are tapped on one side and 12 holes .375-24 and 3 holes .750-16 on the reverse side. 5 different bolt circles are used.

Write for Catalog No. MB-105

Cleveland engineers have designed scores of special machines to cut production costs. It will definitely pay you to put your production problems up to them.

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

CANTON 6, OHIO

For Better Tapping - - Faster!

CLEVELAND lead screw **tapping machines**

American Gas Furnace Co. expands

American Gas Furnace Co. of Elizabeth, N.J., manufacturer of heat treating furnaces and equipment, has granted additional territory in New York State to the southeastern N.Y. representative, Hornbruch Associates of Pine Grove Circle, Scotch Plains, N.J. The new territory will extend representation from Glen Fall through metropolitan N.Y.

Appointments & Promotions

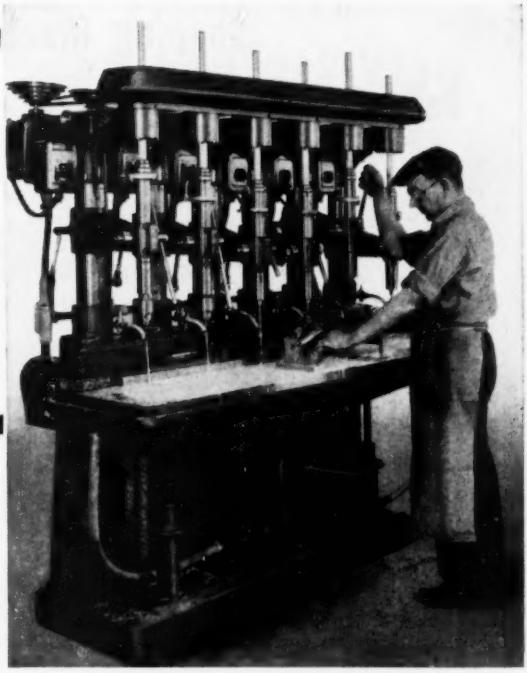
Appointment of **John E. Begert,** director of product commercialization, as vice-president of the Johns-Manville Products Corp. was announced today by A. R. Fisher, president.

C. I. Wallace, manager of the industrial filtration div. of the U. S. Hoffman

"Buffalo" Tips on Better DRILLING

HOW TO LET A WORKER TURN OUT

More Work -Easier!



"Buffalo" No. 16 Six-Spindle Drill

Yes, sometimes it's a case of "letting" a worker step up his turnout! Sometimes an awkward, outdated machine is holding him up. Take the machinist at right. He's drilling and tapping precision parts on a "Buffalo" No. 16 Drill. The sliding heads are readily adjusted to just the right level for comfort all shift long. The table is easily adjusted for different jigs and work pieces, and the six spindles enable him to keep that many setups in operation for real time savings. That's the way "Buffalo" Drills are designed—from the point of view of the man who runs them. And the No. 16 is just one of eight types of "Buffalo" Drills for any type of drilling. Write us about YOUR drilling problem—the right "Buffalo" Drill may well be the answer!

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

161 Mortimer St. Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

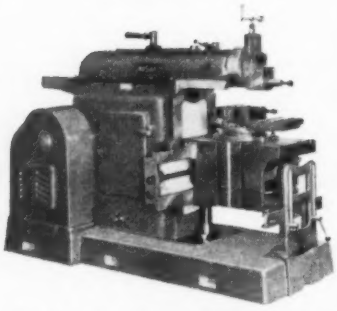
ARISTON S 28-LA

Shaping Machine

Deliveries prompt

Spare Parts available

Service nationwide



Also available:

Ariston S 21-LA (21" stroke)

Ariston S 24-LA (24" stroke)

Ariston S 34-LA (34" stroke)

TOOL HEAD POWER DOWN FEED
AUTOMATIC LUBRICATION

SPECIFICATIONS: RAM STROKE 28" • RAM STROKES PER MINUTE: 9 to 108 • 6 SPEEDS • FEEDS: Table, horizontal 31¼", vertical 15½"; Tool Head 7" • FEED RANGE: .010 to .060 • MOTOR 5 HP

For further information, write or call: MISAL MACHINERY, INC.

ENGINE LATHES | RADIAL DRILLS | TURRET LATHES | **MISAL** | SHAPING MACHINES | MILLING MACHINES | GRINDING MACHINES

1 EAST 53RD STREET, NEW YORK 22 • ELDORADO 5-7278

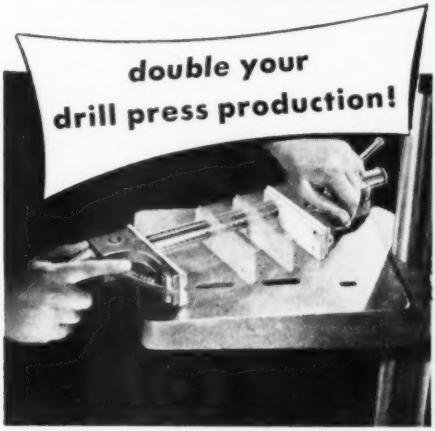
Machinery Corp., Syracuse, N.Y., has appointed **Leonard E. Petzinger** as sales engineer for the Cleveland area, in addition to his duties in the Cincinnati area. Offices will be maintained in both cities.

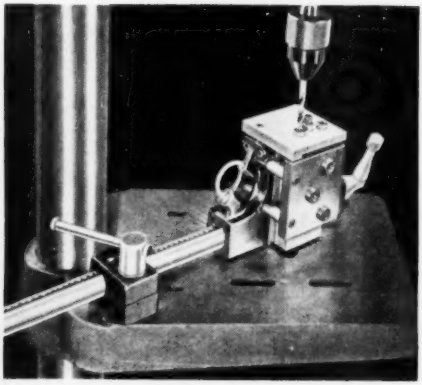
E. B. Meynard, sales manager, Buckeye Tools Corp., Dayton, Ohio, has been appointed general sales manager. **R. V. Shaffer** is now field sales manager. His former position was that of special field representative.

Firth Sterling Inc., Pittsburgh, Pa., has appointed **Robert E. Kimmins** as assistant to the steel sales manager. In this capacity he will take over the responsibilities of the company's high temperature alloy steels.

William F. Jenkins has been appointed as sales manager of the Butterfield Div. of Union Twist Drill Co., Derby Line, Vt., and Rock Island, Que., it was announced by General Manager Stanley L. Holland. He will succeed **L. H. Laythe** who will continue as office manager and sales consultant. **Blaine T. Hall** will assist Jenkins in sales promotion and advertising and **James T. McFadgean** becomes manager of the

NEW AMF Float-Lock Instant-Change Safety Vise





IDEAL BASE FOR DRILL JIGS

Retaining its full-floating and locking features, but otherwise completely redesigned, the new AMF Float-Lock *Instant-Change* Safety Vise is faster, huskier, greater in capacity (9" and 12" jaw openings)... the most versatile, most economical work holder yet devised for drill presses!

New ratchet-locking jaw slides *instantly* to desired opening. The other, screw-operated jaw positively locks—or completely releases—work with a mere flick (about ¼-turn) of the handle.

Vise turns over readily on three sides, permits extensive drilling without removing work. Horizontal and vertical "V" grooves align and grip rounds for end drilling, centering... ideal for angle drilling. Vise serves as low-cost drill jig when locked anywhere on the table... swings out of the way when not needed. Saves so much set-up time, compared with usual work-holding devices, that good operators should easily be able to double their production!

Contact your local AMF Float-Lock distributor for a demonstration. Or write for his name and address and a copy of new, descriptive Folder WF 53-1(a). Wahlstrom Float-Lock Sales Dept., American Machine & Foundry Company, 511 Fifth Ave., New York 17, N. Y.

amf Float-LOCK instant-change SAFETY VISES

MODELS ALSO AVAILABLE FOR BAND SAWS

1500° F. IN 5 MINUTES

Quick-Acting
JOHNSON
No. 120 Hi-Speed
FURNACE
$145.50
F.O.B. Factory

2300° F. IN 30 MINUTES

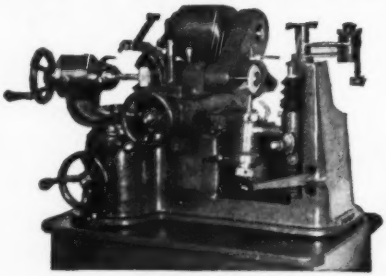
Turn the heat on production. Heat treat carbon and high speed steels, dies and tools in your own plant with JOHNSON No. 120 Hi-Speed. Fast heat-up saves time and gas. Temperatures easily regulated with accuracy. Firebox: 5 x 7¾ x 13½. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

Also available in bench style.
Write for Free Catalog.

Johnson Gas Appliance Co.,
570 E Avenue N.W., Cedar Rapids, Iowa

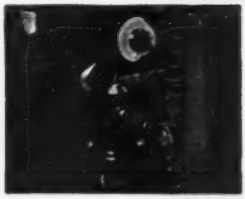
JOHNSON
FURNACES FOR INDUSTRY

HYBCO TAP GRINDER



MODEL 1100

CHAMFER Sharpening



FLUTE Sharpening

GUN POINT Sharpening

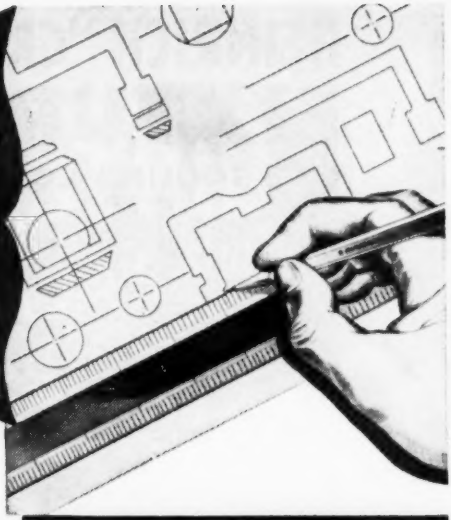
- **Capacities No. 0 Machine Screw to 1½" Hand Taps.**

HENRY P. BOGGIS & CO.
710 East 163rd Street
Cleveland 10, Ohio

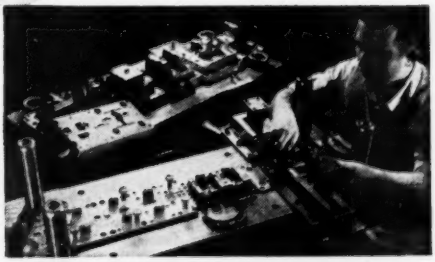
From Drawing Board to Finished Product...

END PRODUCTION BOTTLENECKS . . . ENGINEERING HEADACHES

with **B. Jahn** Production Proved Dies!



Top flight engineers specify "B. Jahn Dies" as a shortcut from drawing board to delivery date. The design and craftsmanship embodied in every B. Jahn Production Proved Die eliminates all guesswork, all trial and error — guarantees flawless die performance . . . die economy . . . die quality!



Thorough inspection of this 10 station progressive die for producing clips to link 60 caliber machine gun shells insures minimum time from production line to battle line. PRODUCTION PROVING from 10 to 50,000 pieces from the die guarantees "proving ground" quality like this —

SEND FOR THE "B. Jahn Story" TODAY!

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

newly organized customer service department.

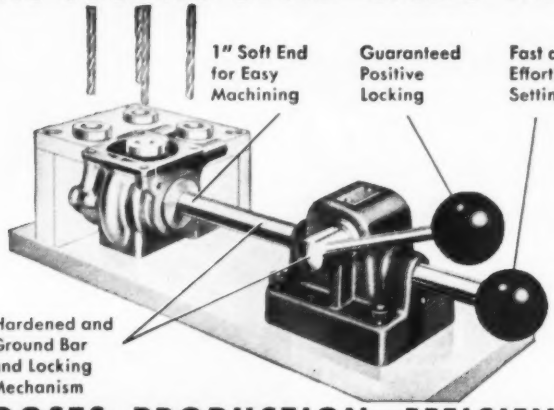
John A. Proven, vice-president of sales for the Porter-Cable Machine Co., Syracuse, N.Y., has named **John C. Jensen** to head the company's new export department, South Haven, Mich.

The Lima Electric Motor Co., Lima, Ohio, has announced the appointment of **Thomas F. Sears**, of Bellaire, Tex., as factory motor distributor servicing manufacturers in Texas and Louisiana.

George F. Thompson has been appointed western zone manager of K. O. Lee Co., Aberdeen, S. Dak., with offices at 830 Venice Blvd., Los Angeles, Calif.

George S. Chiaramonte, sales manager, Horton Chuck, division of the E. Horton & Son Co., Windsor Locks, Conn., announces the recent appointment of **Fred G. Littlejohn** as manufacturers' represen-

HEINRICH "GRIP-MASTER"
FIXTURE LOCK
CUTS TOOLING COSTS—SPEEDS WORK


1" Soft End for Easy Machining
Guaranteed Positive Locking
Fast and Effortless Setting
Hardened and Ground Bar and Locking Mechanism

BOOSTS PRODUCTION, EFFICIENCY

Now—at the request of industry—we offer the new "Grip-Master" Screwless Fixture Lock, applicable for fixtures and jigs used in drilling, milling operations, etc. It incorporates the same high-quality locking mechanism proved by industrial use in the famous "Grip-Master" Screwless Drill Press Vise. Pays for itself quickly by increasing production, cutting tooling costs, etc. See your Dealer, or write for details.

heinrich
TOOLS INC.
FORMERLY NATIONAL MACHINE TOOL CO.

NEW CATALOG FREE

Be sure you have a complete Heinrich Tool Catalog in your files. Your copy will be sent free upon request.

DEPT. 103-K • RACINE, WIS.

DRILL PRESS VISES • FIXTURE LOCKS • NIBBLERS
PUNCHES • ROD CUTTERS

tative for Horton in Southern California and adjacent areas.

Oliver J. Green, formerly New York branch manager for Boyar-Schultz Corp. and cutting tool sales engineer for Brown & Sharpe, New York City, has formed his own company with **Robert Parks**, representative of the Empire Tool Co. The Parks & Green Co., 396 Broadway, New York City, will specialize in the sale of screw machine and production tooling and will represent Empire Tool Co., Detroit, Mich. for the Metropolitan New York area.

The E. A. Kinsey Co., Inc., 16 Washington St., Dayton, Ohio, James H. Cross Co., 2765 W. 8th St., Erie, Penn., and Harris Pump & Supply Co., Brady and Sidney Streets, Pittsburgh, Penn., are among the new stocking distributors recently named by Scully-Jones and Co., Chicago, Ill. These distributors will carry local stocks of Scully-Jones precision holding tools.

step up production with

STOW flexible shaft MACHINES

These dependable STOW FLEXIBLE SHAFT MACHINES save production time . . . speed up output . . . help lower production costs. Variable Speed Models shown are easily portable . . . cut down operator fatigue and increase on the job efficiency!

Constant Speed Models available. Also complete line of accessories designed to increase the utility of STOW Flexible Shaft Machines!

WRITE TODAY

for your free copy of CATALOG 51

STOW Manufacturing Co., Inc., 30 Shear St., Binghamton, N. Y.

Scully-Jones and Co., Chicago, Ill., producer of precision holding and driving tools, has expanded manufacturing facilities to meet the increased demand for "Roll-Lock" chucking tools for holding parts or cutting tools during turning, grinding, gaging or inspection operations.

Lempco Products. Inc., Bedford, Ohio, manufacturer of automotive machine shop equipment and industrial machine tools, announces the appointment of **James J. Strnad** to the presidency. He

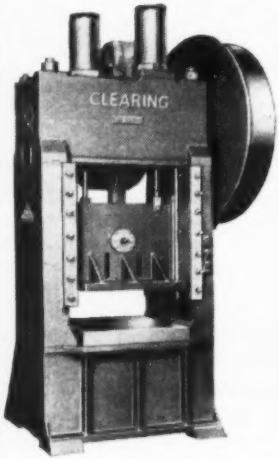
James J. Strnad

James F. Strnad

CLEARING ANNOUNCES

...a new line of single and double crank straight side presses

CAPACITIES — 100 — 250 TONS



200 ton Clearing Single Crank Press

Here are the construction features you've always wanted in presses that give you economy right from the start—maintain it in years of profitable operations.

Write for free bulletins on Single and Double Crank Straight Side Presses

CLEARING MACHINE CORPORATION

6492 WEST 65TH STREET • CHICAGO 38, ILLINOIS

HAMILTON DIVISION, HAMILTON, OHIO

previously held the office of vice-president and general manager.

James F. Strnad, founder of the company in 1918, relinquishes the office of president but continues as chairman of the board of Lempco. In other management changes announced **Wm. J. Blazek** moves up to the presidency of Evans Reamer and Machine Co., Lexington, Ohio, subsidiary of Lempco, and **Albert B. Harding,** Lempco Products vice-president in charge of sales additionally assumes the presidency of Lempco Automotive, Inc.

Wm. J. Blazek

Albert B. Harding

NORTHERN

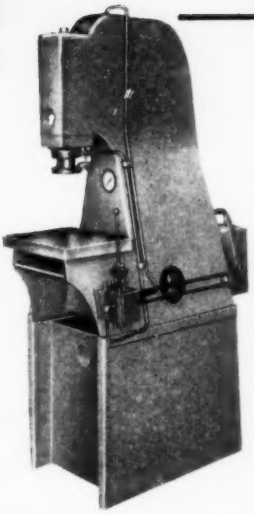
PROVEN POWER—HEAVY DUTY HYDRAULIC PRESSES AT VERY LOW COST

Tough jobs throughout industry are using these presses on production lines in a very wide capacity. As well as, various short run jobs.

Shown is the Model GD which can be had in 10 or 20 ton capacity with strokes up to 24". Models AD or Arch-type frames can be had in 10-20 or 35 tons, also with strokes up to 24".

These presses are all double acting with power both ways.

Presses shipped ready to operate, just make electrical connection.



Write for literature

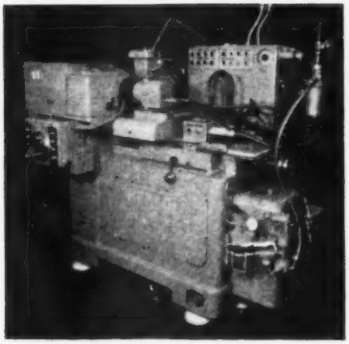
NORTHERN TOOL and MACHINE CO.

1549 North 31st Avenue, Melrose Park, Illinois

SHOCK • VIBRATION • NOISE

ISOLATION NOTES

A precision grinder can produce highly finished surfaces to microscopic accuracy.



For further information, write, wire, or telephone The Barry Corporation, 784 Pleasant Street, Watertown 72, Mass.

But this precision cannot be obtained if the machine is subjected to building-borne vibration from other machines or even from passing traffic.

Barrymounts will protect your grinders from such vibration, to assure the perfect finish they are designed to produce.

The new Barry **LEVELING** Machinery Mount brings you tops in industrial vibration isolation **plus** a unique internal leveling feature. As the attaching bolt is tightened down, the Barrymount lifts the machine foot to the height required for perfect leveling. A lock-nut secures the adjustment —there are no shims to work loose or slip, and there is no need to lag the Barrymounts to the floor.

A well-designed hydraulic circuit can help bring soaring costs down to earth . . . in your product, in your plant. The best-designed hydraulic circuits are built around Gerotor pumps . . . for high efficiency, longer life, less slippage, more uniform flow. Specify Gerotor!

GEROTOR MAY CORP., BALTIMORE 3, MD.

Dorothy Kimmel, has been made vice-president of Lempco International, export division of the company. Assisting the new president at Lempco are **J. F. Fahey**, who has been with the Company more than twenty-one years, and **Herbert A. Spring, Jr.**, treasurer and secretary respectively of Lempco Products and of its three subsidiaries as well.

J. W. Anderson, vice president-sales, of Whitney Chain Co., Hartford, Conn., has announced the appointment of **George A. Banton** as district manger of the company's San Francisco office and **George**

George A. Banton

George F. Haag

WHY WE SPECIFY

LUFKIN LEVELS . . .

No. 59 MASTER PRECISION LEVEL

FOR EXTRA ACCURACY — Special alloy base is less affected by temperature changes. Accurately ground and graduated vial of 10 second accuracy, one division equalling .0005 of an inch per foot. Fine, positive adjustment with extra sensitive (64 threads per inch) screws. Auxiliary level shows lateral position. 15" length.

FOR EXTRA DURABILITY — Design gives maximum protection to vials. Top plate made of special non-conductive insulating material. Made from thoroughly seasoned castings. Machined surfaces scraped with extreme care. Non-machined surfaces have durable black crackle finish.

WRITE TODAY FOR NEW TOOLS BOOKLET DESCRIBING LUFKIN LEVELS

BUY LUFKIN TAPES • RULES • PRECISION TOOLS

276 **From Your Distributor**

THE LUFKIN RULE CO., SAGINAW, MICHIGAN

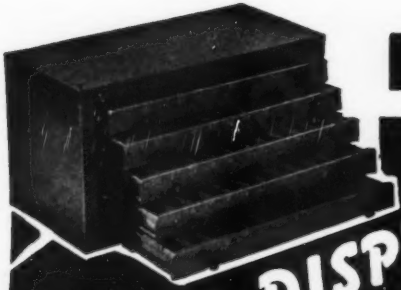
132-138 Lafayette St., New York City • Barrie, Ontario

F. Haag as west coast consultant to **A. J. Swisler,** regional manager. Banton has had many years of experience in the anti-friction bearing field. Haag is widely known throughout the entire Pacific Coast states and is considered an authority on mechanical power transmission.

The Kempsmith Machine Co., Milwaukee, milling machine manufacturers since 1888, announces the appointment of **Theodore F. Eserkaln** as chief engineer. He will direct an accelerated program of engineering developments.

Joseph E. Maurey

T. F. Eserkaln



HUOT

DRILL DISPENSER

Eliminates Rummaging Through Stacks of Drills

No more running out of drills—your entire stock can be seen at a glance. Each size of drill has its own compartment with rounded bottom for easy selection. You can store dozens of small drills and several large ones in their own compartments. Built-in pricing or inventory system eliminates the need for cost sheets, and will keep a record of drills on hand. Stack two or three cabinets to save space. *Specifications:* 14½" long, 7¼" high, 7¼" deep. Hammerlin baked enamel finish over rugged steel. Write for bulletin.

Made in three models for fractional, number or letter drills.

By the makers of HUOT DRILL INDEX

HUOT MANUFACTURING CO.

563 No. Wheeler St., St. Paul W4, Minn.

It has been announced by **Eugene E. Maurey, Sr.**, president and chairman of the Board of Maurey Mfg. Corp., Chicago, that **Joseph E. Maurey** has been elevated to vice-president and general manager.

Russell B. Malloy, formerly district sales manager covering Indiana, Illinois, and part of Michigan, has been appointed national sales and export manager.

Robert L. Holloway has been named chief engineer of American Machine & Foundry Company's Buffalo plant, according to an announcement by **Fred K. Powell, Jr.**, AMF's vice president in charge of engineering. He succeeds **Rus-**

Russell B. Malloy

Robt. L. Holloway

PERFECT ALIGNMENT *Every Time* *with ROOFE Heavy-Duty* BULL NOSE CENTERS

• Two double rows of quality bearings in the large and small ends of the nose of this live center are your assurance of perfect alignment on any type of work.

Two shank sizes provide diameters from ½" to 7½" for a wide range of work with a single center.

Write now for complete catalog of all types of ROOFE Live Centers

HOUSTON GRINDING & MFG., CO., Inc.

2110 QUITMAN STREET • HOUSTON 10, TEXAS

Reliable Distributors Wanted

People work better when they SEE BETTER

3-D GIRL AT SKF

Magni-Focuser multiplies the power of this girl's eyes as she inspects a tiny ball bearing at SKF Industries, Inc.

MAGNI-FOCUSER's matched prismatic lenses give needle-sharp magnification. Comfortably light weight. Fits over regular glasses. Leaves both hands free. Normal vision may be resumed by lifting head.

MAGNI-FOCUSER

SPEEDS PRODUCTION

Leaves both hands free to work

Magni-Focuser—the binocular magnifier—reduces eye-strain and *prevents squinting*—thereby speeding production, increasing accuracy and minimizing the chance of errors and accidents.

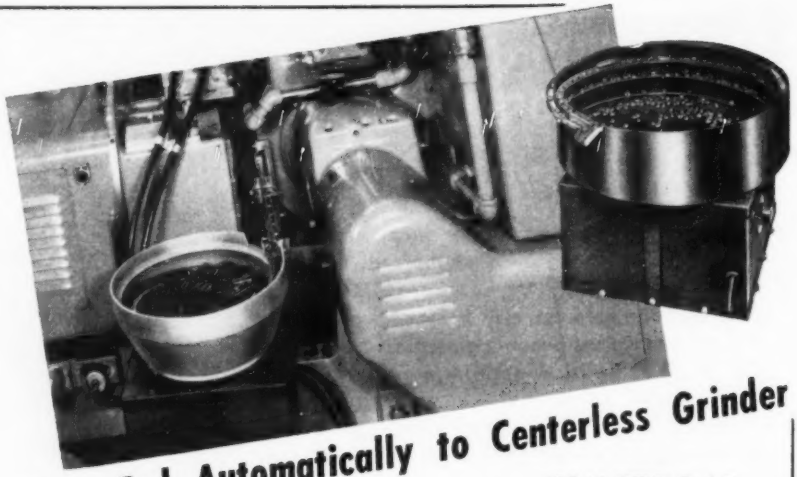
Gauge reading, layout work, inspection, tool and die work are just a few of the jobs that need the Magni-Focuser. Speeds precision assemblies, blue print work. Restores the usefulness of the skilled hands of many older workers whose vision needs a seeing aid.

Magni-Focuser can help your plant produce better. Immediate delivery. 10-day trial without obligation. Return to us if not satisfied. $10.50.

Send for descriptive folder

Gives true third-dimensional ("3-D") vision

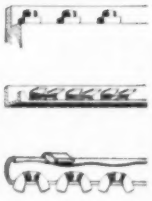
EDROY PRODUCTS CO. 480 Lexington Ave., Dept. 14, New York 17, N. Y.



Slugs Fed Automatically to Centerless Grinder

with *SYNTRON*

PARTS FEEDERS



Small parts emerge from feeder trough in desired position, one at a time, at variable controlled speeds.

Providing completely automatic, oriented, single file feeding to grinding, packaging, inspecting, and many other automatic machines—Syntron Parts Feeders greatly increase capacities and speeds for production handling of small parts. Economical—compact—easy to install.

Write For Complete Catalogue Data—Free

SYNTRON CO.
300 Lexington Ave. *Homer City, Pa.*

sell G. Zuefle who has resigned.

Douglas M. Jones formerly assistant chief engineer and technical consultant, has been appointed chief engineer of Axelson Mfg. Co., Division of Pressed Steel Car Co., Inc., Beverly Hills, Calif. according to an announcement made by W. W. Greenway, Vice-president of Pressed Steel Car and General Manager of Axelson. Jones succeeds **Glynn H. Williams** who has been advanced to a special production engineering post.

Rankin H. McDaniel has been appointed assistant general production superintendent of Solar Aircraft Company's San Diego plant, **B. A. Willsey**, manager of the manufacturing division, announced. **W. E. Ragsdale** is general production superintendent of Solar in San Diego.

Robert S. Sagers has been appointed manager of their New England district by Kennametal Inc., Latrobe, Pa. Mr. Sager has been service and sales representative in Kennametal Middle Atlantic district since 1946.

only RED-E Anti-Friction CENTERS are Superaccurate!

For Light, Medium and Extra Heavy Work on Tubing and Larger Center Holes.

• The world's finest centers are RED-E . . . each type the result of engineering know how, backed up by nearly 50 years of experience. The "Shank" and the "Ball & Roller" Type centers illustrated are just a few of over 200 exclusively designed centers available.

Ask for Catalog "B" (Pipe and Bull Nose Centers). "C" (Anti-Friction Centers). "D" (High Speed—Carbide Tipped Centers).

CENTER *Specialists Since* 1908

RED-E TOOLS **READY TOOL COMPANY**

550-B Iranistan Ave. • Bridgeport 5, Conn.

Kenneth E. Knotts, formerly sales manager of Valvair Corp. has been made district sales representative for the C. A. Norgren Co. in metropolitan New York and northern New Jersey. His headquarters are at 106 Miln St., Cranford, N.J.

E. C. Clark, assistant director of the research and engineering department, has been appointed director of operations, Air Reduction Sales Co. 60 E. 42nd St., New York 17, N.Y., it was announced by **C. G. Andrew**, vice president.

J. W. Anderson, vice president-sales of the Whitney Chain Co., Hartford, Conn., has announced the transfer of **T. Wayne Gehan** and the appointment of **Donald E. Boose** as power transmission sales engineer to the company's Los Angeles office. Gehan comes to Los Angeles from Whitney Chain Company's San Francisco District Office. Boose joined Whitney Chain last April.

GAIN EFFICIENCY . . . SAFETY . . . ECONOMY

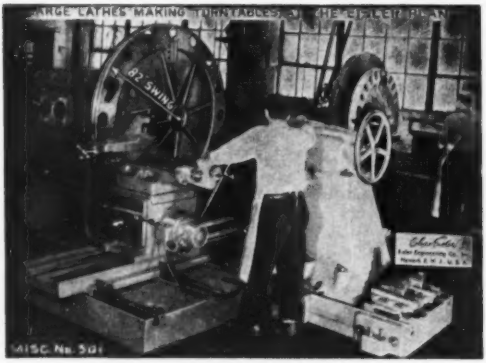
"IMPAX" HAMMERS with specially designed shot-loaded head, strike **controlled** "stay-put" blows . . their mighty impact cuts one blow out of three. Spark-proof surfaces eliminate fire and explosion hazards . . . non-chipping prevents worker injury from flying particles.

For Over Ten Years Industry Has Specified "Nuplaflex Only" . . . NUPLAFLEX TIPS by **actual performance records**, have reduced costs 50% to 90% . . . and more. They possess a toughness, resiliency and self-healing quality not available in other hammers. Comparative on-the-job tests prove NUPLAFLEX often outwear rawhide, rubber, babbitt, lead, copper, wood and ordinary plastic materials at least 20-30 to 1 (actual proof furnished on request).

Make Your Own Test . . . You Will Be Amazed . . . For complete information on NUPLA and IMPAX HAMMERS, also NUPLAFLEX TIPS write your dealer or

NEW PLASTIC Corporation 1026 North Sycamore Los Angeles 38, California

LARGE LATHE Work To Your Order



CAMS

TO YOUR

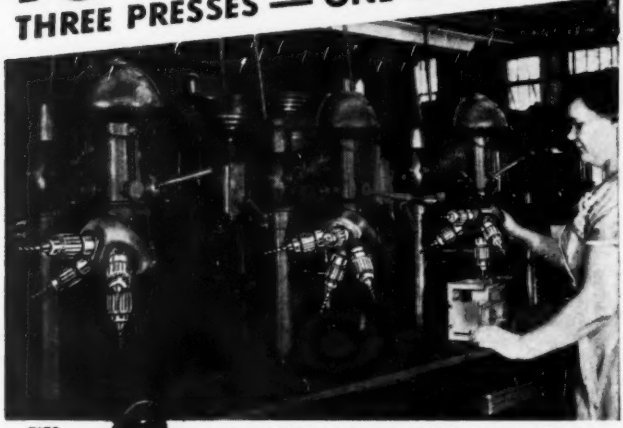
SPECIFICATION

SEND B-P FOR ESTIMATING

EISLER ENGINEERING CO., INC.

762 SO. 13th STREET **NEWARK 3, N. J.**

16 HOLES -- THREE PRESSES — ONE OPERATOR!



FITS ON ANY DRILL PRESS

3 QUADRILLS ON 3 PRESSES DO WORK OF 16 SPINDLES AT RING MFG. CO.

QUADRILL

4-POSITION Instantly Adjustable tool drills, taps, reams, countersinks, counterbores — all on 1 drill press with 1 operator. Does work of 4 presses. Costs less than 1 press.

QUADRILL produces more holes faster—No time loss—Cuts production costs 33%.

Investigate this important time and work saver. *Write for Catalog Today*

CHICAGO QUADRILL CO.

1846 BUSSE HIGHWAY, DESPLAINES, ILLINOIS

Edward H. Platz, Jr., manager of Alloy Sales, Lebanon Steel Foundry, Lebanon, Pa., was appointed chairman of the public relations committee, Alloy Casting Institute, it was announced by **William H. Worrilow, Jr.**, general sales manager of Lebanon.

John P. Kelsey has resigned as assistant treasurer of Sharon Steel Corp., it was announced by **Henry A. Roemer, Jr.**, president.

Kelsey has assumed duties as vice-president and general manager of Mid-American Research Corp.

Harry D. Temporal, manager of the Chicago branch office of Farrel-Birmingham Co., Inc., retired Sept. 1, terminating 43 years of employment with the company. He will be succeeded by **Gerald R. Gonyer**, who has been his assistant for the past five years.

The American Brass Co., has announced the following promotions: **Richard F. Puffer** named assistant general sales manager; **Allen W. Rockwell** made manager of the Waterbury Branch; **Robert R. Vance** succeeds Rockwell as works manager of the Waterbury branch.

TEN THOUSAND GAGES AT YOUR FINGERTIPS

WITH

AMERICAN STANDARD

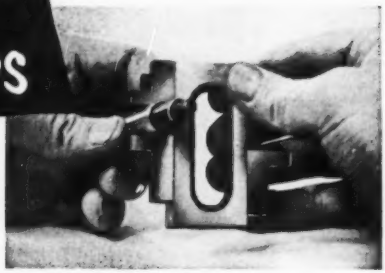
MULTI-GAGE

ADJUSTABLE SNAP GAGE and HOLE GAGE

No valuable time lost waiting for delivery of special gages.

- SIMPLE TO SET WITH MICROMETER or BLOCKS
- LOCKS FIRMLY IN POSITION
- SPLIT TENTH ACCURACY

If your dealer cannot supply you, write to



MULTI-GAGE with snap gage jaws.

MULTI-GAGE with hole gage jaws.

AMERICAN STANDARD COMPANY

Dept. B. Plantsville, Connecticut

I. Melville Stein was elected president of Leeds & Northrup Company recently. Stein, formerly executive vice-president, succeeds **Charles S. Redding** who, after 14 years as Leeds & Northrup president, becomes chairman of the board, a post which has been vacant since the death of Morris E. Leeds in 1952.

Federal Products Corp., Providence, R.I., recently opened a branch sales office to serve Eastern Pennsylvania, Southern New Jersey, Delaware and Maryland replacing **E. R. Glenn**, who was for many years their manufacturers' representative. This new branch sales office will be under the management of **John E. Laffey**.

Wallace M. Kunkel and **Ross C. Stevens** have joined DeWalt Inc., subsidiary of American Machine & Foundry Co., Lancaster, Pa., as district sales managers. Kunkel's territory will be that portion of New Jersey north of Trenton, and Stevens' will comprise the entire state of Connecticut and the counties of Westchester and Putman in New York.

Clarence C. Simoni has been appointed New York district manager of the Johns-Manville industrial products division, it was announced by **C. G. Dandrow**, vice-president of John-Manville sales corporation and general sales manager of the company's industrial products division. P. E. Redding succeeds Simoni as assistant district manager.

Now... From one outstanding source!

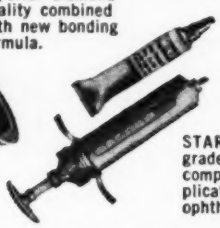
All Your Diamond Abrasive Requirements

THE Star Dust LINE!

A COMPLETE RANGE OF LABORATORY GRADED DIAMOND ABRASIVES FOR EVERY PURPOSE

STAR DUST DIAMOND WHEELS AND HONES
Superior diamond quality combined with new bonding formula.

STAR DUST
Laboratory graded Pure Diamond Powders



STAR DUST Laboratory graded diamond lapping compounds in 18 gram applicator gun—or in 5 gram ophthalmic tipped tube.

You can put your confidence in the STAR DUST line as so many others do because STAR DUST quality is consistent quality—the result of our special process of laboratory crushing and grading to achieve uniform nodular shape. That means *all* particles work for you. Be "Laps Ahead." For easier grinding and mirror finishes specify STAR DUST products.

For complete information and catalog write Dept. A-9

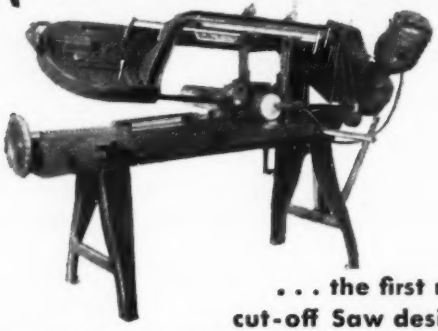
ACE ABRASIVE LABORATORIES
250 WEST 57TH STREET • NEW YORK 19, N. Y.

D. C. Lynch, vice president and general sales manager of Brush Electronics Company, announces **J. P. Arndt, Jr.**, former manager of the crystal sales department, has been appointed assistant general sales manager in charge of staff functions such as sales promotion, advertising, customer service, distribution control, sales training, market research and order service. Arndt succeeds **A. J. W. Novak**, assistant general sales manager for operations, now in a new post as head of all line sales activities including the equipment department, tape recorder department, component department, and international department.

J. A. McConnell, president of Procunier Safety Chuck Company of Chicago, Ill., announces the appointment of **Robert E. Oscar** as export manager of the company.

Henry W. Fritz has been appointed Mid-West sales manager for the Quijada Tool Division of Gaines-Collins, Los Angeles manufacturers of automatic pipe cutting and threading machines.

NEW **THE WELLS MODEL 800 HEAVY-DUTY CUT-OFF SAW**



. . . the first metal cut-off Saw designed for use with High Speed Steel Band Saw Blades

THE NEW WELLS MODEL 800, engineered to use blades 1" in width, is a heavy duty, metal cutting band saw designed to bring new accuracy and efficiency to your production cut-off operations.

Model 800 is also the first metal cutting band saw approved for use with high speed steel band saw blades. When used with this type of blade, a higher level of cutting efficiency has been attained in cutting stainless steel, die blocks and other tough metals.

See your Wells dealer for further information or write direct

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

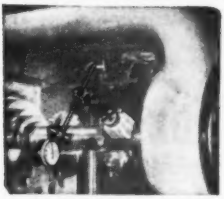
WELLS MANUFACTURING CORPORATION

707 Coolidge Ave. - Three Rivers, Mich

Norton Company of Worcester, Mass., announces **Stewart J. Bell**, abrasive engineer in the western Michigan area for many years, will retire after almost 40 years with Norton; **Allen C. Moore**, formerly of the Detroit office sales engineering department, has been named an abrasive engineer and will assume Mr. Bell's former duties; **Harlan W. Cobb**, presently office manager of Norton's Cleveland office, will become a field engineer covering the area serviced by that branch; **Philip H. Threshie**, formerly a field engineer on the West Coast, has been appointed an abrasive engineer and will cover that area in and around San Diego and the entire state of Arizona; two recent graduates of the sales training course have been named field engineers and assigned to the Los Angeles area. They are **Robert P. Cooper** and **Robert N. Hamilton.** New office managers have been named to posts in district offices. **Edmund H. Gagnon** will assume those duties at the Cleveland warehouse and sales office, and **Everett M. Story** will take over the duties of office manager at Hartford, Conn.

ENCO
TINY TITAN NO. 100 New Superior Magnetic Base Holder
TRADE MARK

FOR MOUNTING TEST INDICATORS INSTANTLY TO FLAT OR DOWN TO ¾" ROUND
WITH PULL OF 65 LBS.



Model 100 being used to align fixture in production mill.

- Every indicating problem now easily solved.
- No more indiscriminate clamping.
- All materials and workmanship unconditionally guaranteed.

NEW! 3-step universal rod for all indicators. Sizes 11/32", ¼" and 5/16" diameters.

NEW! Ball swivel and stem of non-magnetic material.

NEW! Sure-grip non-breakable tenite plastic case 1¼" wide, 1 11/16" long and 1½" high.

NEW! Fool proof adaptor allowing 360° adjustment in all directions.

NEW! Magnetic pull 65 lbs.

PRICE $8.00
COMPLETE.
Attractively boxed.

SEND NOW FOR BULLETIN NO. 605 COVERING OTHER TINY-TITAN TOOLS

NO. 120	Combination magnetic base indicator holder and magnifier	$12.50
NO. 130	Precision adjustment magnetic base holder, pull 65 lbs.	$ 9.50
NO. 150	Heavy duty duplex magnetic base holder, pull 125 lbs.	$15.50
NO. 160	Precision adjustment heavy duty duplex magnetic base holder	$17.75
NO. 200	Magnetic base "HANDI-LITE" pull, 65 lbs.	$ 8.50
NO. 250	Heavy duty magnetic base lighting unit—holds 100 watt bulb	$18.50

ENCO MANUFACTURING COMPANY, Dept. 2103
4520-26 W. Fullerton Ave., CHICAGO 39, ILL.

Order from your mill supply dealer or send order with name of your mill supply dealer

Kennametal Inc., Latrobe, Pa. announces the following appointments: **Robert P. Schwing** and **Edward R. Willerton** as representatives and **William H. Hiltebeitel** and **Samuel H. Jones** as service engineers in Middle Atlantic District, headquarters 3701 N. Broad Street, Philadelphia, Penna.; **Louis Lekich** as service engineer in the central district branch, 5531 Woodward Avenue, Detroit; **Richard W. Phelps** as service engineer in the Milwaukee district, headquarters, 744 N. Fourth St., Milwaukee.

Appointment of **Oscar F. Haug** as project engineer for the Ultra-Viscoson, new ultrasonic instrument for measuring the viscosity of fluids, has been announced in Detroit by **L. A. Hyland**, vice president in charge of engineering of Bendix Aviation corp.

Formerly an engineer on the design and development of guided missile electronic components at Bendix Aviation research laboratories, Detroit, Haug moves to the company's Cincinnati division to handle engineering for volume production of the Ultra-Viscoson.

Carl B. Christensen, president of Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn., announces that the Machinists' Tool & Supply Co., 3690 Santa Fe Avenue, Los Angeles 58, Calif., has been appointed as exclusive distributors for the RED-E line of anti-friction, high speed, and carbide-tipped centers, grinder and milling machine dogs. They will cover the Los Angeles and southern California areas.

H. R. Wilson, a sales representative in the Indianapolis district office of Allis-Chalmers general machinery division since 1948, has been named manager of

ONE MAN...
bends 2" x 2" x 3/16"
Angle Iron
EASILY...

with the . . . HYDRAULIC POWERED
HOSSFELD UNIVERSAL IRON BENDER

Hydraulic unit provides plenty of bending power at your fingertips for smooth effortless bending. Reduce hand labor . . . speed up work . . . improve quality of bends. Fast and accurate, the Hossfeld Hydraulic Bender handles rounds, flats, pipe and angle iron. Forms rings, coils, "U" and "S" bends, eyebolts, spring eyes, etc. Gain higher production with lower labor costs.

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SawMore
METAL CUTTING MACHINES

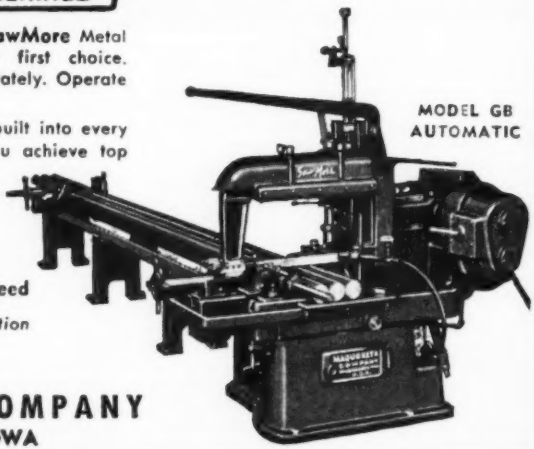
FAST METAL CUTTING . . . MADE EASY!

If it's speed you need . . . **SawMore** Metal Cutting Machines are your first choice. **SawMore** Machines cut accurately. Operate at lowest cost.

These highlight features—built into every **SawMore** Machine—help you achieve top production.

- **Self-aligning blades**
- **Automatic feed**
- **Gears—constant mesh**
- **Positive compensating feed**

Write for complete information on the advantages of SawMore Machines



MODEL GB
AUTOMATIC

MAQUOKETA COMPANY
CLINTON, IOWA

the company's Rockford, Ill., branch office.

The Sterling Abrasives Division of The Cleveland Quarries Co., Tiffin, Ohio, announces the appointment of **Philip de Veau** as sales engineer for the state of Wisconsin. He has had wide experience in industrial sales, having been previously employed as manufacturer's agent for the M. B. Austin Company. Mr. de Veau resides at 743 North Fourth Street, Milwaukee.

Firth Sterling Inc., has announced the promotion of **Raymond J. Zale** to assistant to the sales manager, steel division. He will assume the responsibilities for the sale and promotion of tool steel products. Until his recent appointment, Zale was a steel metallurgist at Firth Sterling.

James Y. Scott, president of Van Norman Co., Springfield, Mass., recently announced four promotions: **Vice-President Roger L. Pyne**, who has been in charge of all activities within the machine tool division, will henceforth concentrate on the engineering phases of that field;

Herbert L. Freer, production planning manager, was named general sales manager in the machine tool division;

Edward C. Hellyer, production planning superintendent was named production planning manager;

George A. Raiche, public relations director, was promoted to advertising manager, a position he will hold in addition to his present work.

Deluxe Saw and Tool headquarters moved to High Point, N.C.

The Deluxe Saw and Tool Co., a subsidiary of Rockwell Mfg. Co, of Pittsburgh, Pa., is transferring its national headquarters and out-of-state manufacturing facilities from Chicago, Ill. and Columbus, Ohio, to its High Point plant, W. F. Rockwell Jr., president of the parent company, announced recently.

Alfred G. Feldman, general manager, who previously made his headquarters at Columbus, has already moved to High Point, and new machinery, equipment and personnel are being added to the plant.

L. M. Klinedinst dies

L. M. Klinedinst, a former vice president and director of The Timken Roller Bearing Company, died in Aultman Hospital in Canton, August 10, of a heart ailment. Starting with the company in 1905, he rose to the position of vice presi-

dent in charge of sales and director, which position he held when he retired in 1948.

Edward Payson Bullard, Jr., 1873-1953

Edward Payson Bullard, Jr., a pioneer in the machine tool industry, died recently at his home in Fairfield, Conn. Mr. Bullard was born at Columbus, Ohio, July 10, 1873.

He entered the employ of The Bullard Co., Bridgeport, Conn., founded by his father, on March 10, 1892, as an apprentice machinist. In 1907 he was elected president of the company, following the death of his father. Mr. Bullard received more than 60 patents for his developments and twice received national honors for his work. He served as president of the National Machine Tool Builders Association 1911-1913.

Please mention MACHINE and TOOL BLUE BOOK when answering advertisements, or use the handy Readers' Service Card on page 64.

Men who had to "lick" the very problems you're facing designed... ROUSSELLE PRESSES

That's why they're fast, accurate, so adaptable, so easy to operate. Why maintenance is simple. Why initial cost is low . . . Often considerable savings and improved punch press operations are possible if you let our engineering staff assist you. There is no obligation. Simply furnish the details relating to your need or problem and if possible send samples or drawings of the work. You will hear from us promptly.

Sold Exclusively Through Leading Machinery Dealers

Rousselle Presses are Manufactured by

SERVICE MACHINE CO.

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Drill More Holes Per Hour
In ANY Pattern . . . On ANY Drill Press

with a *Adjustable* **MULTI-DRILL**

Drills 2 to 8 holes at one stroke

model **900**

Increase production up to 800% . . . save time, cut costs. MULTI-DRILLS make *any* drill press produce *more*. Attached without alterations or special tools. Quick, easy setups of universally adjustable spindles give you more flexibility . . . wider application. Handles any hole pattern within 9" circle; centers close as ½" Extension Spindles available to increase working area to 22½". Special adaptations available.

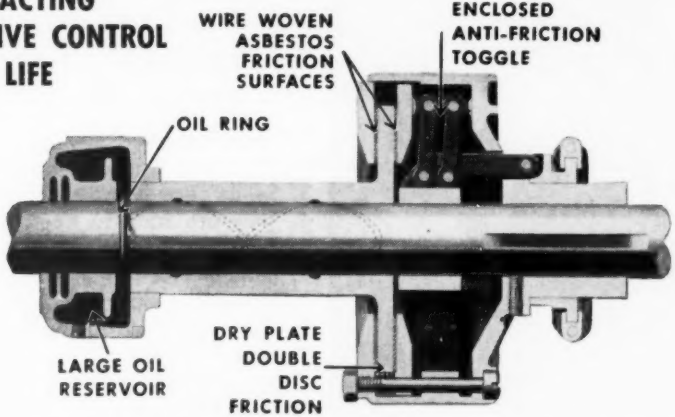
DRILLS ANY HOLE PATTERN

COMMANDER MFG. CO.
4221 W. Kinzie St. Chicago 24, Illinois

See us at Booth 835, Metal Show, Cleveland, Oct. 19-23.

Product of *Commander* . . . Builder of Production Tools

FAST ACTING
POSITIVE CONTROL
LONG LIFE

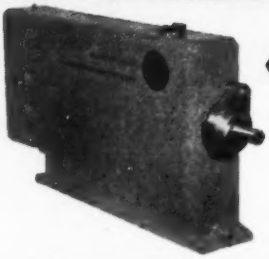


BROWN
MULE PULL
CLUTCHES

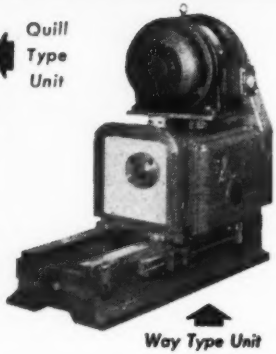
This time-tested clutch provides maximum power transmission at lowest cost. For specifications and prices on wide range of sizes, write for Bulletin No. 25. Brown Engineering Co., 126 N. Third St., Reading, Pa.

HYDRAULIC POWER UNITS

Here are the simplified, leak-proof, accurate hydraulic power units for all your special machine applications. A completely self-contained unit is available in a variety of capacities and models to suit every design requirement. They can be used for drilling, reaming, boring, milling, facing and many other operations, individually or simultaneously.



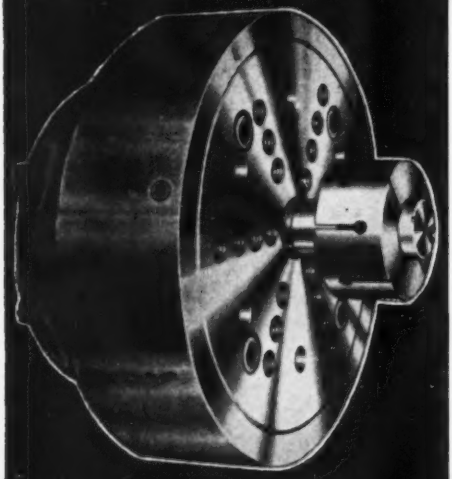
Quill Type Unit



Way Type Unit

Lee Engineering Company, Inc.

4700 BURLINGAME • DETROIT 4, MICHIGAN



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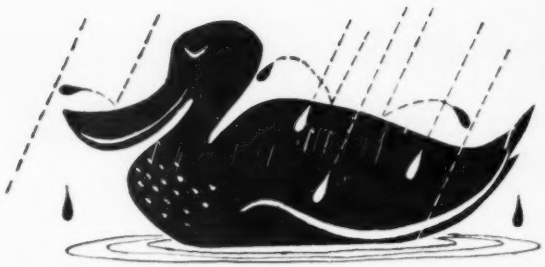
1. They increase production.
2. They give greater accuracy.
3. Set-up time is shorter.
4. They are safer to operate.
5. First cost is low.
6. Maintenance cost is low.
7. Design is simple.
8. Guaranteed to do the job.
9. Service is prompt.

Speedgrip Precision Internal Chucks will save you money on second operation work.

WRITE FOR FREE MANUAL

SPEEDGRIP CHUCK 820 N. WARD STREET ELKHART, INDIANA



HOW TO DUCK THE WELD-SPATTER PROBLEM

Use Protect-O-Metal and weld spatter wipes off as easily as water from a duck's back! With Protect-O-Metal you speed welding and save up to 85% of weld cleaning time and labor. Brush or spray P. O. M. in weld seam and on adjacent metal—weld—then brush off spatter in seconds.
Just a little P. O. M. goes a long way too—costs less than 1/10c per foot of weld protected, saves up to three times its cost in time savings alone. Order a trial gallon ($3.25) satisfaction guaranteed or invoice will be cancelled.

PROTECT-O-METAL

POM

GWSMITH

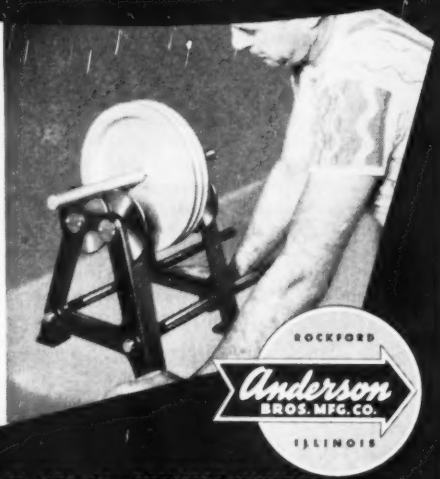
G. W. SMITH & SONS, INC., 5410 Kemp Road, Dayton, O.

PRECISION BALANCING WAYS

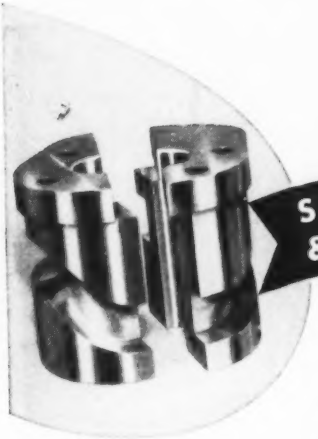
Save Time . . . Cut Cost

Balance rotating parts easier, faster, more accurately with supersensitive Anderson Balancing Ways. No setup, no leveling, no centering. Chilled iron discs, ground and balanced to extreme accuracy, rotate with minimum friction on special bearings. Glass-hard spindles and bearings prevent wear or ball-bearing indentations when balancing heavy weights. Superior accuracy lasts throughout long life. Proved and preferred 38 years. Write for bulletin 10-23.

Swing	Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



ANDERSON BROS. MFG. CO., ROCKFORD, ILLINOIS



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For Automatic Timing & Control Mechanisms,
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Prompt quotations on receipt of prints or specs.
For better delivery at lower cost write:

AMERICAN CAM COMPANY, Inc., Hartford 1, Conn.

Zagar 1" collet holding fixture cuts costs in center drilling shafts.

take a short cut—

depend upon Zagar-holding and indexing fixtures for milling, drilling, tapping and grinding

"Skip" the many special set-ups, jigs and fixtures formerly needed to hold and index. Maintain accuracy and close tolerances. No vertical movement in closing. Stop insures exact duplication of parts. Pipe tap hole provides for lubrication of cutting tools and washes out chips. Index any number of positions from 2 to 25 (4, 6 and 8 divisions standard). 1" and 2" sizes.

Write for Manual B-10.

ZAGAR TOOL, Inc., 24000 Lakeland Blvd. Cleveland 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

Only

THRIFTMASTER *Universal Joint Type* DRILL HEADS

have these exclusive* features

***Standard Full Ball Bearing Construction, including Spindles**

Driving assembly is Full Ball Bearing mounted with 3 Bearings on each spindle. Thrust load carried by radial thrust bearings.

***Standard Slip-On and Slip-Off Template Construction**

For accurate setting and locating spindle brackets are machined to receive slip-on and slip-off template.

6 **Standard Models** . . . Models U-608 and U-1000—Ball Bearing. Models U-620B and U-1012B—Plain Bearing, 11/16" or ½" min. centers. Models U-608-BS and U-1000-BS—Ball Bearing Gear Case, Plain Spindles.

Semi-Standard Heavy Duty Full Ball Bearing . . . ½" in Cast Iron—1-7/16" min. centers—7⅛" or 9¾" dia.

½" in Steel—1-13/16" min. centers—7" or 9⅝" Dia.

Also Larger Adaptations and Full Line of Fixed Center Drill Heads.

WRITE FOR FULL INFORMATION

Subsidiary of Thomson Industries, Inc.

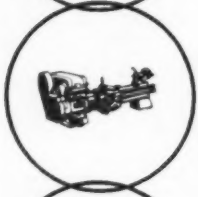
THRIFTMASTER *Products Corporation*

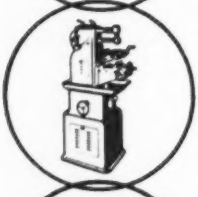
1030 N. PLUM STREET
LANCASTER, PENNA.

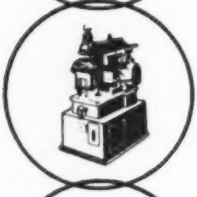
Also Makers of
DORMAN AUTOMATIC REVERSE TAPPERS

SHELDON

CHICAGO U. S. A.







Write for Catalog

OFTEN PAYS OUT ON THE FIRST JOB...

and gives additional years of "cost free" service.

In the past, lathes were generally bought as large and as heavy as possible to insure accuracy and sufficient power. Now, with accurate, low-cost Sheldon Precision lathes, it is more profitable to buy these faster, cost-cutting lathes for the specific job at hand just as you would buy jigs and fixtures.

In savings of tooling costs, operator cost, power cost, and plant loading, as well as extra profits from more pieces per hour, Sheldon lathes often pay back their cost on a single run.

Sheldon lathes will work to the closest tolerances—have "Zero Precision" Taper Roller Bearings. They can take a healthy cut when operating at high speed direct drive—have double V-belts to the spindle. They will swing 10", 11" or 13" and have a 1-3/8" hole through the spindle—have sufficient capacity for the great bulk of lathe work. Sheldon lathes have created a new factor for figuring machinery costs. They are tools you should know about.

SHELDON MACHINE CO., INC.

4242 N. Knox Ave. Chicago 41, Illinois

What's New IN METALWORKING

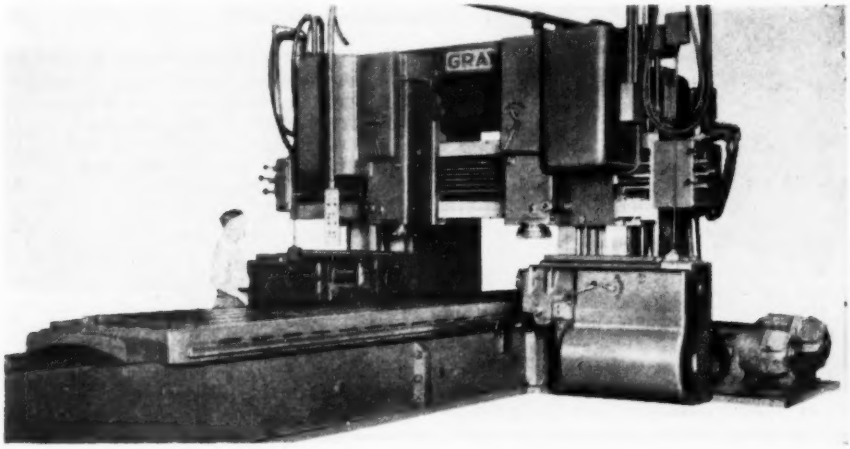
New Design Gray Planer–Type Miller

THE G. A. GRAY CO., Dept. BB, 3611 Woodburn Ave., Cincinnati 7, Ohio, has announced its new design planer type milling machines. Shown is a 54" x 48" x 20' Gray double housing milling machine that was recently delivered to the American Locomotive Co. The four independent unit milling heads are each provided with 50 h.p. spindle motors for heavy duty carbide milling of steel fabrications and castings.

Other new features claimed, besides those on present machines, are summarized in the following paragraphs:

Straight line housings have 27" faces vs. 15¾". Larger machines will have 37" faces. The old "dog leg" outer wall is now a full depth straight line wall. These two big features mean greatly increased strength and rigidity of side head and rail support.

Oversize square locks on housings and cross rail will absorb greatly increased feeding pressures when cutting in the forward or reverse directions. Dovetails have been eliminated. Housings square lips are 4" thick.



100% formica bearings; gibs, plates and bearings are faced with laminated plastic plates. There are no metal to metal bearings. Since the chances of scoring are almost non-existent, the running clearances may be greatly reduced. This permits more accurate head alignment and minimizes chatter which makes higher feed rates possible. Non-metallic table ways can be furnished as an extra feature.

Double opposed taper gibs permit quick and easy adjustment of spindle tram. Finer finish cuts with precision laps are more readily obtained.

14" quill travel instead of old style 10" materially increases the effective machining range of any size machine. 14" quill travel is now available on all sizes and types of Gray heads.

Extra high spindle speeds—Range 10 to 1000 r.p.m. in 21 speed changes in approximate geometric progression.

Power rail feed is now a standard feature on all double housing Gray millers. Saddle type right angle attachments are becoming increasingly popular. To get the most from such an attachment, power rail feed is required.

Elevating screw guards protect the vital elevating screws from abrasive dirt and flying chips.

Power head swivelling is available as an extra for Gray offset rail heads. The powerful head may be effortlessly swivelled by convenient push button control.

Simplified wiring is available upon special request. Subterranean conduits are eliminated. Installation and servicing are materially improved.

Oversize cross rail design increases the face from 22" to 24", 28" and 32" depending upon machine size. Rail stiffness has been increased, rail head support has been greatly augmented.

Oil jet centers are self-lubricating

Tool Service, Box 10265, Dept. BB, Tampa 9, Fla., has developed a new concept in center lubrication that is said to give the accuracy of a dead cen-

Pressure Blast Application #68

Only Pressure Blast Gives You 2-Speed Wet-Blasting!

FEMALE DIE CAST DIE

MALE DIE CAST DIE

MODEL A . . . ONE OF 4 STANDARD UNITS. CUSTOM MACHINES DESIGNED TO FIT SPECIAL REQUIREMENTS.

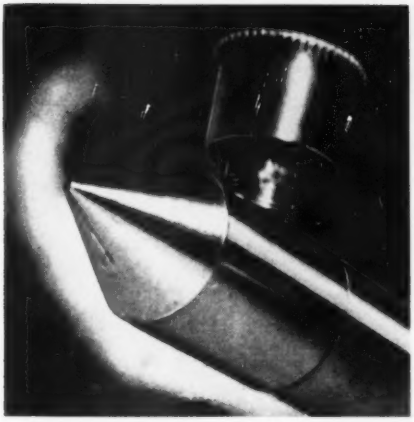
Pressure Blasting of this die casting die cuts hand finishing by 75% . . . reduces break-in time from 1 day to 2½ hours by aiding in good lubrication control. The use of pressure blasting in new die manufacture and die maintenance makes dies last longer . . . improves finish of die cast parts, too!

FREE . . . Learn what PRESSURE BLAST can do for you! Die and Mold Polishing, Blending Grind Lines, Deburring, Heat Treat Scale Removal, Honing of Cutting Tools, Pre-plating Cleaning . . . Hundreds of proven, money-saving applications!

Write for our new 8 page fully illustrated Booklet . . . or send samples of work you want tested to:

The CRO-PLATE Company Incorporated

747-7 Windsor Street Hartford 5, Conn.



ter with a long life and convenience of a live one. Lubricant is stored in the grease cup and supplied to the work through a tiny jet in the center point (0.040" dia.). The grease cup can easily be replaced by a grease gun fitting, for use with a grease gun, where lack of space makes it desirable.

These centers come with their 60° points tipped over the full length with either high speed steel, hardened, or an extremely wear and heat resisting cast alloy that is claimed to outlast h.s.s. several times. They are said to be accurately ground, with the shanks made of a good tool steel and left unhardened.

Frequent stopping of the machine and misalignment caused by releasing and re-tightening tail spindle in order to allow lubricant to penetrate is eliminated. Clean lubricant is always available by simply turning the grease cup. Since the center is virtually self-lubricating, once the grease has become warmed, attention is said to be seldom needed.

Burgmaster Model 2BH 6-spindle automatic turret drill

Burg Tool Mfg. Co., Dept. BB, 3743 Durango Ave., Los Angeles, Calif., announces another series of Burgmaster universal type production machine—the Model 2BH, said to cut costs on any second operation for small lots or a large quantity of parts.

GRAND offers

HIGH-QUALITY
SEMI-STEEL
SURFACE PLATES

Precision Ground or Scraped to close tolerance for layout and assembly work.

Reinforced with heavy ribs.

Three-point support.

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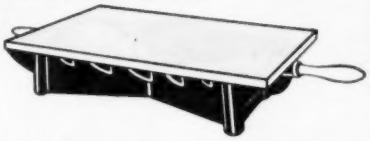
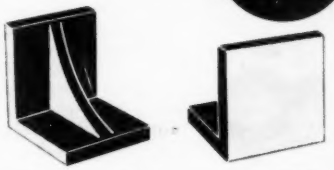


Size	Approx. Shipping Weight	Ground Finish	Scraped Finish
12x12	40	$22.50	$42.50
12x18	60	27.50	62.50
18x24	100	79.50	112.50

GRAY IRON
ANGLE PLATES

Machined ± .002" From Flat

FROM STOCK



2" x 2" x 2"	$2.70
3" x 3" x 3"	3.60
4" x 4" x 4"	4.40
5" x 5" x 5"	8.40
6" x 6" x 6"	10.90
8" x 8" x 8"	16.70
12" x 12" x 12"	45.00

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F. O. B. — N. Y. C.
Prices subject to change without notice.

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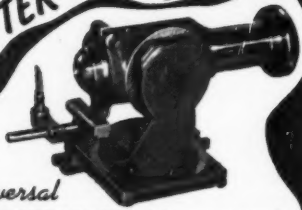
176-A GRAND ST. • NEW YORK 13, N. Y.

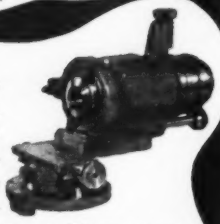
NOW! A LOW-COST CUTTER GRINDING FIXTURE



The *Universal*

CUTTER GRINDING FIXTURE fits any universal tool or surface grinder. The basic unit, shown here (standard accessories not shown), with its four attachments, below, provide a quick and accurate answer to nearly all cutter and tool grinding demands.

Precision BALL END MILL grinding is done with this compact, easily-operated fixture. An exceptionally flexible instrument, it grinds up to 2¼" dia., sets at any angles or radius with any cutting clearance on square, conical or ball nose shaped end mills.



◀ The MULTI-SWIVEL VISE attachment employs three swivels for quick set-up of any compound angle.

◀ This versatile INDEXING LOCK BRACKET may be set up in any position at either end of spindle housing on basic unit.

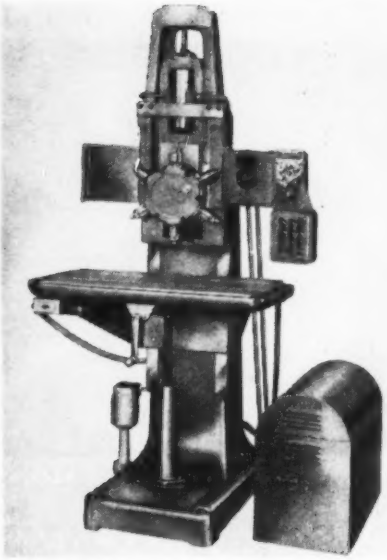
◀ For precision GRINDING WHEEL DRESSING this attachment will handle any two angles as well as set radius.

Send for descriptive literature.
Several good territories in U. S. and Canada are open to qualified representatives. Write:

ROCHELEAU TOOL AND DIE CO.

650C No. Main St. Leominster, Mass.

Export Office: Staten Trading Co. 481 Broadway, New York 13, New York Cable Address: STRADESO, N. Y.

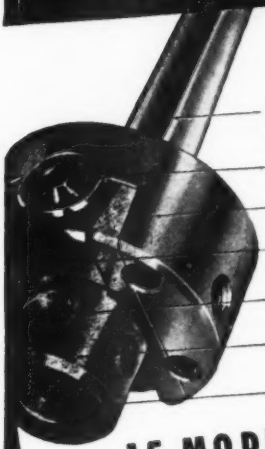


The outstanding feature is the infinitely variable hydraulic feed which can be manually controlled for automatic operations. The increased efficiency of this model enables one operator to operate one or more machines at the same time.

Other features claimed are: infinitely variable feeds; 12 pre-selective spindle speeds for each spindle; simple control enables women operators to operate efficiently and without fatigue; precision double ball bearing spindles insure long, trouble-free and smooth operation; 19" table travel with large work table allows large or small parts to be performed on this one machine; positive depth stops can be easily set—preselective to each spindle; traverse away from work for tapping, rapid traverse to starting, when tapping is not performed—the cycle will be rapid traverse to predetermined point, feed to depth, rapid traverse away from work; skip indexing will eliminate loss of time where 4 or 5 tools are used—machines can be set to past idle spindle; 60"x51"x 78" high; weight 2500 lbs.

FLYNN

FOR 35 YEARS THE LEADING NAME IN BORING HEADS



15 MODELS

Flynn has studied boring head applications for many years—builds a size and design for every job with all the wanted features Machinists with real appreciation for quality and precision prefer Flynn.

FLYNN MANUFACTURING CO.

133 Flowerdale
Ferndale 20, Mich.

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FLYNN Catalog

This *Free* Sample Kit

CMD ANTI-SCORING LUBRICANT

Will show you how to:

- **Increase your production**
- **Prevent scoring and seizing**
- **Protect bearing surfaces better**

Here is a free sample kit of CMD Anti-Scoring Lubricants, designed for *your* use on *your* machines so that you can see how it will help increase production by preventing costly shutdowns. Also CMD lubricants positively prevent seizing, galling, scoring and are non-corrosive. Any bearing surface is absolutely protected with CMD. Send for your free kit and use CMD on lathe centers, steady rests, cams, taps and in many other applications where positive lubrication is demanded under high pressures. Do it today and see if you don't think CMD is tops!

Use it for
LATHE CENTERS • DIE SET POSTS • MACHINE WAYS • THRUST BEARINGS • CAMS—DIES—TAPS • GRINDING CENTERS • MILLING MACHINES

FREE SAMPLE KIT

Please send, under no obligation to me, Free Sample kit No. 42 containing CMD Lubricants.

Name_____

Company_____

Address_____

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Chicago Manufacturing and Distributing Co., 1906 West 46th St., Chicago 9, Illinois.

CHICAGO MANUFACTURING AND DISTRIBUTING CO.

UNIVERSAL CHUCKS

save time
save money

- low first cost, due to simple design.
- wrap-around gripping action eliminates scored tool shanks.
- precision manufacturing assures tools running true.
- sizes from 1/16" to 1½", shanks to fit any type machine.

Standard Collet Chucks for a wide variety of applications.

Floating Chucks for reaming and tapping.

Coolant-Fed Chucks for deep hole drilling.

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FRANKENMUTH 10, MICHIGAN

173-B

Stop and Shop at Rivett's production corner

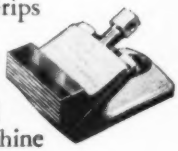
DRAW-IN COLLETS

Stocked in all standard styles...checked 25 times against master gauges... guaranteed to run "dead true" at collet mouth. Write for Bulletin 100.

THREAD TOOL

No operator skill required to produce perfect threads. Duplicates threads without gauging. Mounts on any screw-cutting lathe. Write for Bulletin 110.

LOCKJAW



Set-ups stay put! Grips both downwards and sidewards... eliminates bolting and clamping. Used on all table top machine tools. 2 sizes available. Write for Bulletin 140-A.

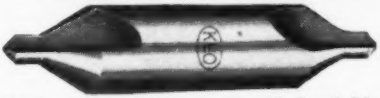
RIVETT LATHE & GRINDER, Inc.

Dept. MTBA10

Brighton 35, Boston, Massachusetts

KEO

CENTER DRILLS



Made of finest high speed steel. Available in all standard sizes. Always in stock for *immediate delivery*. Specials made to your specifications.

KEYSEAT CUTTERS

High speed. Right hand ½" shank. Diameter from ¼" to 1½". Standard sizes in stock for immediate delivery. Complete set —41 sizes—available in sturdy, hardwood box. Saves time and money, because you always have the size you need.

CENTER REAMERS

High speed steel. Reamers from ¼" to 1" regularly furnished with 60°, 82°, 90° included angle. Specials made for your specifications.

LATHE MANDRELS

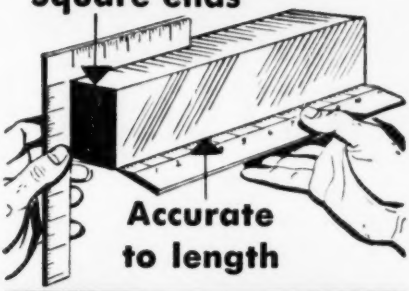
Precision made of tool steel, hardened and accurately ground. Tapered .0005" to the inch. Mandrels from 8/16" to 1" are .0005" undersize at small end, from 1⅛" to 3", 001" undersize. Immediate delivery.

Write for Literature

Illustrated literature and prices on all KEO Products mailed on request.

KEO CUTTERS
19326 Woodward - Detroit 3 Mich.

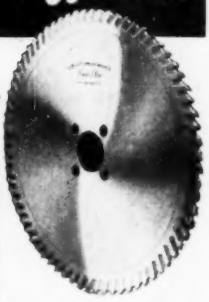
Square ends



Accurate to length

with **MOTCH & MERRYWEATHER**

Triple-Chip **cut-off saws**



Ask for our Circular Sawing Handbook.

Segmental — 11" through 108" dia.
Solid — 8" through 20" dia.

Down with scrap! Up with usuable production! Whatever the material or shape or size, Motch & Merryweather has a segmental or solid blade for the job. You get highest practical speeds, ends square and burrless, cut-off pieces meeting close tolerances. Resharpen repeatedly at low cost. Obtain Triple-Chip long life and economy.

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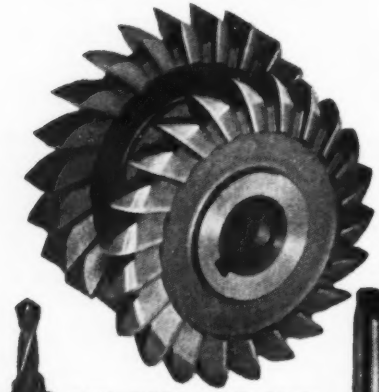
THE MOTCH & MERRYWEATHER MACHINERY CO.
715 PENTON BUILDING
CLEVELAND 13, OHIO

Triple-Chip METHOD

REMEMBER — IT'S THE COST, PER CUT THAT COUNTS!

Only M & M builds ALL 3: CIRCULAR SAW, SAW BLADE, BLADE GRINDER

RUTLAND



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For rapid changeover of Tool setups

SPECIAL TOOLS FROM STANDARD TOOLS

All types of special reamers, cutters, end mills and drills can be made from standard catalog tools. We can make these specials to your blueprints quickly and economically from our large stock of standard cutting tools.

Mail your specifications or blueprints today for immediate price and delivery.

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M-B Model S-VT 18,000 RPM

"SPEE-DEE" Pneumatic POLISHER

A development filling a distinct need. Produces remarkable results on real production work when abrasive rolls and pencils, also bands, etc., are used. Flexible air-control lever for starting and stopping. Husky, light weight, 14 oz. Power to spare. Special grease-sealed bearings. Will handle many applications, also with "High-Speed" Rotary Files.

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Also "M-B" PNEUMATIC GRINDERS

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Automatic AIR LINE FILTERS, REGULATORS and LUBRICATORS

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"Remember, Built-In Quality Remains Long After First-Cost Disappears"

Representatives in Principal Cities

Write for Literature

M-B PRODUCTS
46 Victor Ave.
DETROIT 3, MICHIGAN

Hand-operated drill sharpener

The True Point drill sharpener for number drills, sizes Nos. 41 to 60 and Nos. 61 to 80, right and left hand is being manufactured by Up-to-Date Tool Co., Dept. BB, P. O. Box Station A, Worcester 8, Mass.

This instrument is operated with an abrasive. The oilstone, used in the sharpener, is said to be superior to wheel sharpening since a very small amount of metal is removed each time. It is said to be particularly helpful in fine instrument work and research laboratories.

Cervinia 2 ST milling machine

Shown is one of the leading models of the imported Cervinia milling machines, distributed by Misal Machinery Inc., Dept. BB, 1 E. 53rd St., New York 22, N.Y.

This model has 12 spindle speeds and 8 feeds in geometrical progression. A multi-disc clutch and spindle brake assures immediate stop or reverse of the spindle. There are Timken-type spindle bearings and an adjustable cross screw. The latter eliminates backlashes. Electrical controls and start-stop buttons are built in.

The column and base of the Cervinia milling machines are of fine grained semi-steel, designed to distribute heavy work loads properly, and combine maximum stiffness with rigidity.

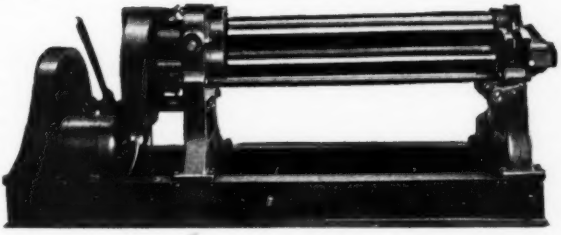
The spindle is made from solid forging of high grade alloy steel, and is designed to provide mass and weight of metal close to the spindle nose.

The upper part of the column is fitted as a compartment for the spindle gear

Beloit

INITIAL TYPE
BENDING ROLLS

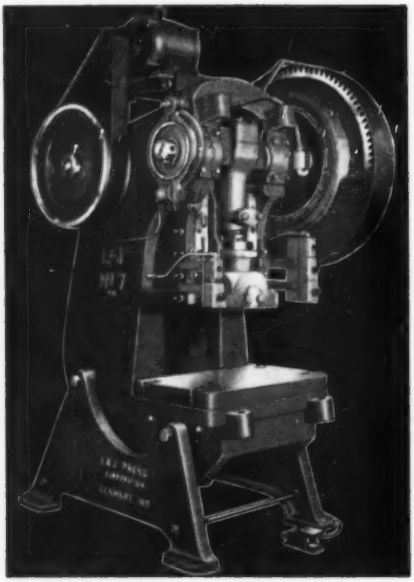
Sheets and plates are quickly formed into cylindrical shapes with this efficient, hard working Beloit Bending Roll. Built for years of trouble-free service. Easy to operate. Rolls are of slip type. Hinged housings permit speedy removal of completed cylinders. Reversing lever places machine in readiness for the next job. Do forming quicker easier and at lower cost with Beloit equipment.



Picture is one member of the famous Beloit line which also includes Punches, Shears, Rod Cutters, Notchers, Bending and Straightening Rolls.

Write for complete details

HENDLEY & WHITTEMORE CO.
100 Blackhawk Blvd. Beloit, Wis.



L&J PRESSES

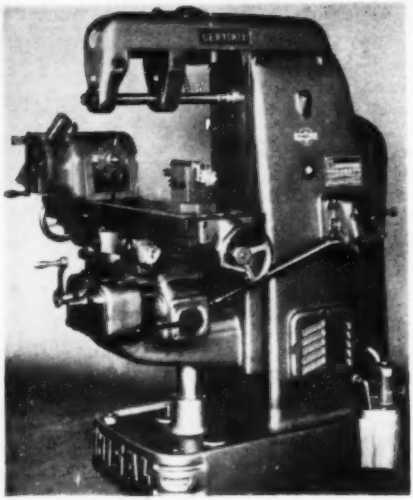
MORE PRODUCTIVITY AT LOWER COSTS

The accuracy and productivity of an L&J No. 7 (80 ton) Press plus the advantages of an L & J Fawick Air Clutch* give you an ideal combination for reducing costs and improving quality of your press work. It permits maximum speeds plus greater safety and shock-free, full-power operation.

*Trouble-free because of no end thrust, no springs, no keys, no shifting parts. Pneumatic clutch element on flywheel constricts to grip drum on crankshaft flange.

6 to 80 ton models. *Write for literature.*

L&J PRESS CORPORATION
1625 STERLING AVENUE
ELKHART, INDIANA



box. This box contains hardened and ground gears made of special steel that run in an oil bath. All shafts are of nickel-chrome steel, hardened and ground where necessary, and mounted on ball bearings.

Movable trip dogs disengage the power feeds at any predetermined point in their travel. In addition, there are fixed limit stops to prevent damaging the machines through oversight.

Large diameter dials graduated in thousandths of an inch provide for micrometer adjustment in all directions. Hand cranks are automatically disengaged and held out of re-engagement while the power feed is in use.

It is possible to clamp the table, saddle and knee in any position of travel.

The overarm is of rectangular design with dovetail guides.

The one piece arm support brace can be easily set up or removed at the operator's will.

A dividing head, complete with tailstock, is supplied as standard equipment.

Cold process solder

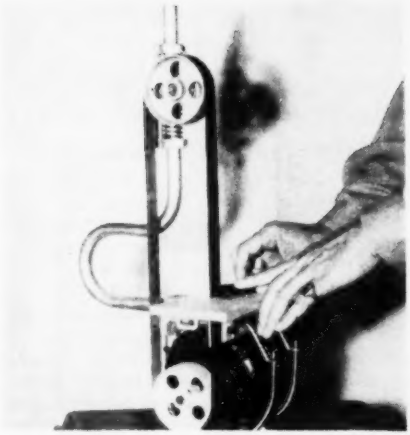
A new improved plastic metal base cold process solder that is claimed to be ideal for filling imperfections in cast-

ings, patterns, machinery, and all other metal surfaces has been announced by the Woodhill Chemical Co., Dept. BB, 1391 E. 33d St., Cleveland, Ohio.

Duro Solderweld No. 53 is a metallic plastic in putty form. The solder is applied cold, just as it comes out of the can, the only tool necessary is a spatula or putty knife. It dries to a metal hardness when exposed to the air, drying time depending on how thick the solder is applied (generally 20 minutes if room temperature is 70° or warmer.) When dry, it can be ground filed, or sanded down to a level feather edge. No skill or special tools are required in its use. It will flex and is particularly ideal in applications where shock resistance is of importance.

FF Gordo belt sander

John P. Fox Co., Dept. BB, 5514 York Blvd., Los Angeles 42, Calif., announce the FF Gardo belt sander, 1" wide, that is said to be handy for machine shops, woodworking shops, plastic shops, lapidary, watchmakers and hobby shops.



The sander mounts on motor. Anchoring to bench is unnecessary. It can be used as portable equipment and the motor mount provides a base for additional table surface. The belt tension

Victor's Specials Deserve Your Attention!

EXTRA L-O-N-G LENGTH

Straight Shank
HIGH SPEED DRILLS
Immediate Delivery

12" LONG . . . 9" CUTTING FLUTE

Size	Net	Size	Net	Size	Net
1/8	$1.65	19/64	$2.25	15/32	$3.60
9/64	1.65	5/16	2.25	31/64	3.60
5/32	1.65	21/64	2.50	1/2	3.60
11/64	1.65	11/32	2.50	17/32	4.00
3/16	1.65	23/64	2.75	9/16	4.25
13/64	1.80	3/8	2.75	19/32	4.50
7/32	1.80	25/64	3.05	5/8	4.80
15/64	1.95	13/32	3.05	21/32	5.20
1/4	1.95	27/64	3.30	11/16	5.60
17/64	2.05	7/16	3.30	23/32	6.00
9/32	2.05	29/64	3.60	3/4	6.50

VICTOR MACHINERY EXCHANGE, INC.
DEALERS IN TOOL ROOM EQUIPMENT
251-A Centre St. • New York 13, N. Y. • Phone: CAnal 6-5575

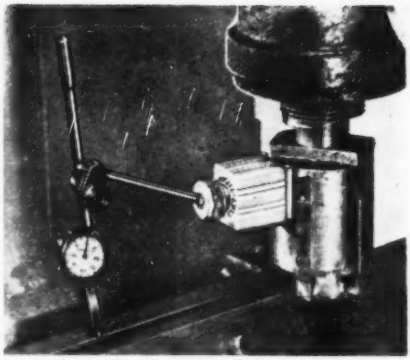
adjuster is self leveling and insures use of 42" to 46" length belts 1" wide. The tilting work table is reversible. Direct drive eliminates v-belts and pulleys.

The weight is approximately 6 lbs., and dimensions are 3½"x11¼"x16½".

Magnetic base dial indicator

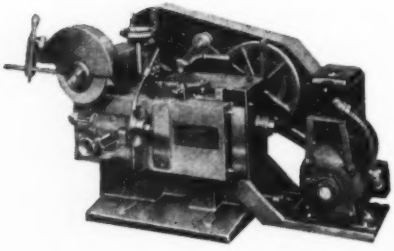
Enco Mfg. Co., Dept. BB, 4520-26 W. Fullerton Ave., Chicago 39, Ill., announce "Tiny-Titan" No. 100, an indicator holder which mounts instantly to flat or rounds down to ¾" in diameter with a pull of 65 pounds.

"Tiny-Titan" No. 100 consists of: (A) The sure-grip non-breakable Tenite plastic case 1¼"x1-7/16"x1½" high, equipped with vertical ribs for deftness of manipulating. Steel parallel ribs 1-7/16"x¼"x¼" provide the magnetic contact surface on the bottom of the unit. (B) The ball swivel of brass and stem of non-magnetic material which isolates the magnet from the indicator—and important Enco improvement. A knurled locknut quickly secures the post position firmly. (C) a 3-step universal rod 6" in length, with diameter sizes 7/32", ¼", and 5/16"—for accommodating all indicators. (D) A swivel adaptor which allows full 360° adjustment in all directions. (E) Adaptor for attaching 5/32" stud type indicators.



Particular attention is called to the new circuit which Enco has developed, giving this small tool the extraordinary

RESTORES BROKEN SAW TEETH AND SHARPENS THEM in GANGS



Saws can be ganged up, 100 saws at one setting and ground at one time. The 35T Automatic Metal Saw Grinder reclaims them and adds many extra hours of useful life. The saw is fed to the grinder automatically at the rate of 30 teeth to the minute. Grinding is indexed automatically and is accurate to ± .001".

WRITE FOR BULLETIN 35T

WARDWELL

Maker of largest line of saw and tool sharpening machines

THE WARDWELL MFG. CO.

3165 Fulton Road Cleveland 9, Ohio

magnetic pull of 65 pounds. Also, what is regarded as another engineering triumph is that "Tiny-Titan" No. 100 will mount to rounds as small as ¾" in diameter—another exclusive Enco feature.

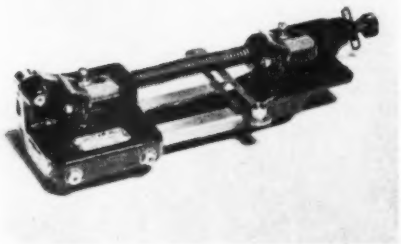
"Tiny-Titan" No. 100 eliminates awkward clamping. It introduces a new experience in speed of adjustment, backed by infallible accuracy. There are no unwieldy knuckle joints or pivot screws and bushings to wear or cause indicator lag, but a versatile swivel adaptor that allows full 360° adjustment in all directions, locking securely to post.

In use, the desired dial indicator is attached by means of the 3-step universal rod to "Tiny-Titan" No. 100 and the unit placed so as to bring the indicator dial contact point into position for making the test. Because of the ball swivel and stem, and the swivel adaptor, absolute precision positioning is assured by the manufacturer.

Hitch feed

A new hitch feed is announced by the H. E. Dickerman Mfg. Co., Dept. BB, 321 Albany St., Springfield, Mass.

Featuring a heavy, semi-steel main frame and moving member, as well as increased feed lengths, the design re-



tains the gripper plate principle. Feed lengths up to 2½" may be attained, and stock thickness of .031" maximum feed. Stock insertion or removal is performed instantly, without tools. The

PRODUCTION BORING with E-Z SET by Maxwell

Only the **MAXWELL E-Z Set** boring tools feature **high speed operation, micrometer-like adjustment** to 0.0001-inch and **maximum boring range.**

Interchangeable shanks permit **E-Z Set** boring tools to be used in turret lathe, jig-bore, milling machine, boring mill, automatic or other machine tools. Because they can be adjusted for cut in only one-tenth the time formerly required by similar tools, these **Maxwell-made** tools can meet high-speed production on schedules.

E-Z Set boring tools are available in three models having maximum boring bar capacities of ½, 1 and 1½ inches and covering a boring range of from ⅜ to 20 inches.

Write today for catalog.

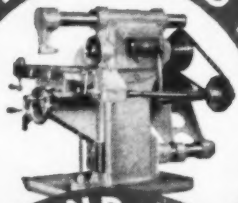
396-MC

THE MAXWELL COMPANY

220 Broadway • Bedford, Ohio

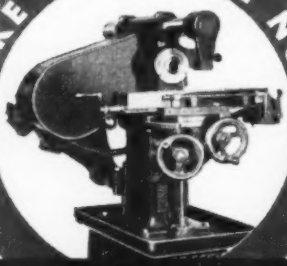
THERE'S A STURDY
BURKE
FOR EVERY PURPOSE
Thousands of efficient, low cost Burke Bench Millers are proving their superiority in Tool, Development and School Shops and a wide variety of mass production operations.

BURKE POWER FEED NO. 4



BURKE HAND FEED NO. 3

BURKE UNIVERSAL NO. 4



Send for complete data on models attachments, accessories and suggestions for putting Burke's to work for your profit.

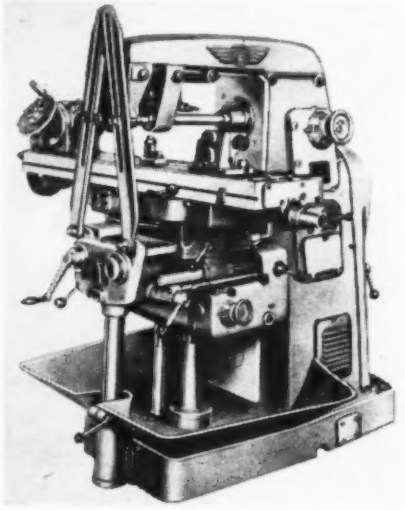
THE U. S.-BURKE
MACHINE TOOL DIV.
Brotherton Road 1, Cincinnati 27, Ohio

new feed may be mounted on the die set or attached to the bolster, to feed from any direction, and two or more may be used to feed separate ribbons from different directions to be worked and assembled in the die. It is identified as the 2½" Model K hitch feed.

Danish milling machines have sliding column-support

Hercules No. 2 Precision milling machines, manufactured in Denmark are being distributed by Parker Machine Co., Inc., Dept. BB, 158 Pioneer St., Brooklyn 31, N.Y. Plain, universal and vertical types are available and all feature a sliding support column for front end of the knee, which can be clamped in any position for increased rigidity. Hardened and ground gears are used throughout, and the milling spindle runs in adjustable roller bearings. Column and knee ways are also hardened and ground.

Machines are equipped for power rapid traverse in all three directions and the table feed and rapid traverse are all controlled by a single lever. Electro-dynamic braking provides quick stopping action. Weight of the table, saddle and knee is counter-



balanced by a heavy coil spring inside the support column. These machines are said to be built to American Standards.

Diamond wheel lubricant

A lubricant to eliminate the loading and glazing of diamond wheels and laps and for lubricating diamond hones has been announced by the Stadoil Mfg. Co., Dept. BB, 3300 Durfee Rd., El Monte, Calif. It is claimed that it provides correct lubrication even though only tool and holder pressure is needed, providing a tool finish free from scratches and the maximum degree of finish so essential for the carbides.

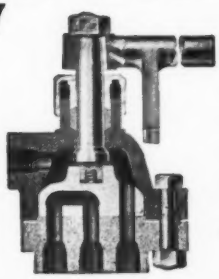
This lubricant can also be used for diamond grinding, for lens generating laps, for wire drawing dies, and as a carrier for diamond dust; sizes are available in ½ pint to 50 gal. containers.

Engineers' adjustable protractor design

An all new concept in adjustable, engineers protractor design and adapta-

This Large Processor

Chooses Nicholson Valves for LONG WEAR



A large rubber firm reports that Nicholson cylinder control valves recently completed 10 years of constant use, without servicing, on an operation which had proved too much for other tested units. This report further confirms that Nicholson valves, with their specially treated hard seats and non-corrosive lapping flat discs, become tighter with use. For air, gas, oil, steam, water in lever, foot, solenoid and motor types. Press., 300 to 5,000 lbs.

CAT'G. 552

117 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

bility has been announced by the Way-Mac- Mfg. Co., Dept. BB, 8112 Melrose Ave., Los Angeles 46, Calif. Called the Tractograf, any number of angles, from zero to 180° can be drawn instantly without turning, sliding, or moving the protractor out of position at any time. Simply swing upper rule arm to desired angle and lock adjustment knob. A magnifier, built-in over the registration mark, gives clear, hairline adjustment every time. Dial is white and easy to read. The 180 degree arc is calibrated in sharply defined 1° and 5° divisions.

BK4 process for sintered carbide

Harwil Ventures, Dept. BB, 2746 W. 59th St., Chicago 29, Ill., claims that a new process, called the BK4, increases the cutting life of carbide tools at the same time improving the finish on machined parts.

The process may be used on any grade of carbide now on the market, and is done on a weight basis only. There are no restrictions as to size, shape or quantity of blanks. No change in grinding practice, after using the process, is needed. Previously established feeds, speeds and depths of cut can remain the same.

The manufacturer claims that the treatment doesn't merely impart a case hardening effect, but penetrates the entire volume while retaining its Rockwell hardness. Subsequent brazing or grinding doesn't alter the quality of the process. Furthermore, it is said that tests show two to ten times longer life for the processed tools.

Thread gage inspection

Quality Control Corp., Dept. BB, 401 Broadway, New York 13, N.Y., announces a new service of certified thread gage inspection, said to step up production and reduce manufacturing costs.

Many machine shops that do not have the facilities for checking such gages, often have a large amount of rework and scrap machine parts.

Thread plug gages are checked to

LAST WORD
WHEEL DRESSERS
Simplify the Job!

PRECISION
ANGLE TANGENT TO RADIUS
WHEEL DRESSING

- Dresses grinding wheel at point of contact.
- Shortens dressing time.
- Simplicity of setting.
- Rugged for long life.

Above: These and countless other forms may be dressed simply with the Last Word Wheel Dresser. Write for Catalog

Also Distributors of
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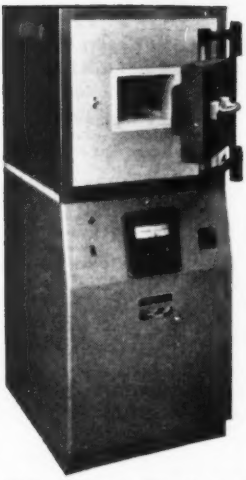
A NEW FURNACE



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Range: 300°F. to 2,000°F.

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Electric Heat Treating

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For Precision Production and Lab. Work

This new Huppert Model "K-R" is ruggedly constructed to meet severest production requirements, yet offers a high degree of accuracy for laboratory experimentation. Complete with transformer, contactor, switch box, Huppert Infitrol and indicating electronic temperature controller. All connections factory installed. Shipped ready for operation.

Write today for literature on complete line of Huppert furnaces and ovens in floor and table models.

Model No.	Inside Dimensions			K.W.	Prices Single Phase	
	Wide	High	Deep		220 volt	440 volt
K-R 668	6"	6"	9"	2	$ 710.00	$ 770.00
K-R 6613	6"	6"	13"	3.5	800.00	860.00
K-R 8613	8"	6"	13"	5	990.00	1,050.00
K-R 10813	10"	8"	13"	8	1,240.00	1,370.00
K-R 10818	10"	8"	18"	12	1,450.00	1,580.00

K. H. HUPPERT CO.

6845 Cottage Grove Avenue
Chicago 37, Illinois

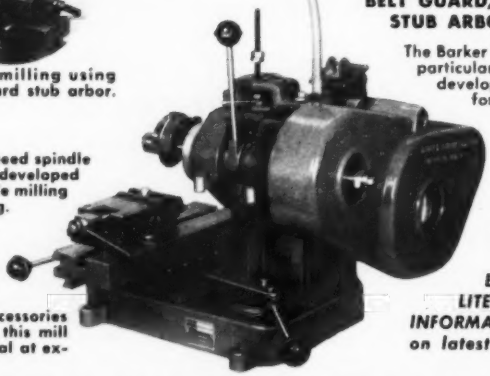
Manufacturers of Electric Furnaces and Ovens

determine the wear in the pitch diameter to .00005, the lead error to .0001, the angle to 2' to 8' depending on the pitch, major diameter to .0002, minor diameter to .0002, and thread form as to clearance.

Thread ring gages are checked to determine the angle to 5' to 10' depending on the pitch, minor diameter to .0002, lead error to .0001, and thread form as to clearance, fit on a master setting plug and if they are within the tolerance of current government specifications they are sealed.

The company also maintains an indicator repair department for rebuilding indicators and indicating gages, domestic and foreign. All indicators are disassembled and cleaned and all worn and broken parts are replaced. Also, all indicators are tested for accuracy with a special micrometer calibrating machine to determine the error in each graduation on the dial up to 2½ revolutions of the hand and to check the spring tension at the contact point.

Straddle milling using our standard stub arbor.



The low speed spindle drive was developed for straddle milling and slitting.

Special Accessories shown on this mill are optional at extra cost.

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SPECIAL LOW SPEED SPINDLE DRIVE, BELT GUARD, CUTTER GUARD, VISE, STUB ARBORS and RISER BLOCKS

The Barker Engineering Dept. has given particular attention to the design and development of special accessories for use with this versatile mill. BARKER MILLS ARE USED TO BUILD MORE BARKER MILLS... and by utilizing these accessories on our own mills, in our own plant we have virtually accomplished "miracles" on our production line...

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Here's a Production Cutter

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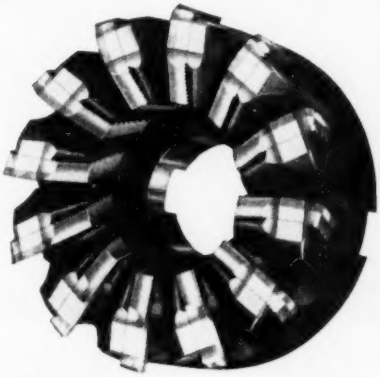
HEAVY DUTY JOBS

APEX offers many cutters for many jobs. Here's one that takes a big chip fast. It can be had with H.S.S., Stellite, Cobalt or Carbide tipped blades. These blades adjust automatically in two directions. No damage to carbide tips. Diameters from 8" to 24". We also make cutters for *lighter* work. Write for catalog.



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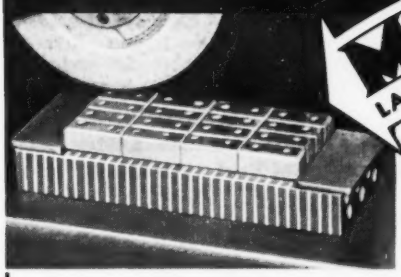
LAMINATED PARALLELS and V BLOCKS

Ideal for small pieces and any odd shapes that cannot be put directly on the surface plate.



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Performance

Hollow-ground and bright all over, Reltool End Mills are not only the best looking end mills you ever saw . . . they're proven in performance and cutting efficiency. In addition, they're designed for *easy chip flow* and 10% to 35% longer cutting life. Next time you need End Mills, re-tool with Reltool!

The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

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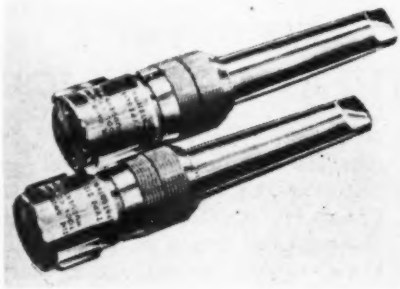
RELIABLE METAL CUTTING TOOLS

4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.

A 7531-½

Wickman-Brown floating reamers

The Wickman Mfg. Co., Dept. BB, 10325 Capitol Ave., Detroit 37, Mich., announces the Wickman-Brown floating reamer as an addition to their lines



of diamond wheels, grinding machines and tapping attachments.

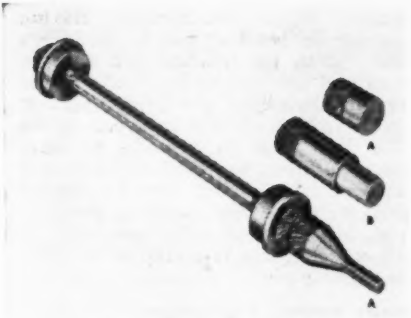
The floating reamer is said to assure accuracy of bore—absolute concentricity and a superfine surface. Reamer blades may be sharpened or renewed and their floating action is positive, constant and effective throughout the full range of the reamer.

These Reamers are of two types—S type being equipped with standard blades while the SL type has blades designed for reaming blind holes. Blades are made of either high speed steel or are tungsten carbide tipped. Reamers are available in fourteen sizes—diameters range from ¾" to 4" inclusive.

Collet stop permits faster, more exact 2nd operation

Wade Tool Co., Dept. BB, Waltham, Mass., has brought out a new collet stop they claim makes it easier for the lathe operator to perform certain second operation work. For instance: it is frequently required that second operation work be located in the collet at the same setting every time to obtain duplicate shoulder lengths.

The Wade collet stop serves this purpose to three outstanding advantages: 1. The stop is held immovable in the lathe spindle regardless of whether the collet has an indeterminate endwise lo-



cation or not, so that shoulder lengths are always held exactly the same; 2. In setting the position of the stop it is not necessary to remove the stop from the collet and the collet from the lathe for any required adjustment. The adjustments are made entirely from the rear end of the spindle with a screwdriver; 3. Because the stop is held in position by means outside of the collet itself, in the draw bar, practically the full length of the collet (4") may be utilized for the work piece. Thus the work piece is not limited to a length of 1 or 2 inches within the collet, as in the case of a stop which is also held within the collet. Furthermore, because the stop is held externally, there is no possibility of distorting the collet from internal pressure as can occur in holding the stop within the collet.

Wallace no. 490 series rolling machine

The Wallace rolling machine made by Wallace Supplies Mfg. Co., Dept. BB, 1300 Diversey Pkw'y., Chicago 14, Ill., is made up of rolled steel plates and sections, electrically arc welded with all welds stress-relieved. The frame housing protects the gears or chain drive and for protection to the machine operator.

The pushbutton controls are mounted on a pedestal stand connected to the machine with a flexible steel cable.

Maximum capacities-depending upon size of the rolling machine: pipe or conduit I.P.S. 1¼" to 3½"-steel tubing 1¾" O.D. to 4" O.D.

This rolling machine has fast action,

EXACT MEASUREMENTS
REQUIRE PRECISION TOOLS

Accuracy of measurement depends on the precision of the measuring tools. Provide your Shop and Inspection Department with dependable and proper inspection tools. MEEHANITE METAL TOOLS, made to close tolerances, are furnished in many types.

Surface Plates — Box Parallels
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repeat positioning roll adjustment. When the initial setting of the bending roll is completed, the re-indexing is accurately controlled by the hydraulically actuated toggle mechanism. Having once set the bending roll to produce a given radius, the bending roll may be raised and lowered by hydraulic power without disturbing the initial setting. A pitch roll attachment is placed on the fixed drive roll to provide an easy means to obtain the pitch desired in a coil. The initial bend may be started anywhere along the length of the material. Many helical coils are designed with end tangents to facilitate the inlet and outlet piping.

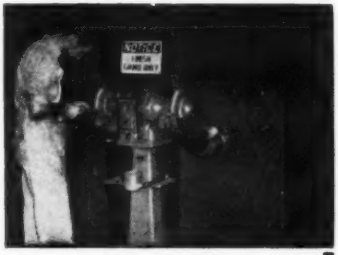
Sheet metal fasteners in new types

Metal or hard surface parts containing drilled or punched holes can be temporarily held together in alignment and under pressure when combined materials are as much as four inches thick, according to Wedgelock Co., 5446 Satsuma Ave., N. Hollywood, Calif.

Better known in the aircraft industry for use with thin sheet metal, Wedgelock metal fasteners in a new variety of sizes offer advantages to other in-

STOP DUST

with DUSTKOP



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Machine Parts Anchored in Cerromatrix Machining Eliminated

No machining time is required to securely and accurately anchor the slide rods in this radial saw.

Cerromatrix, a low temperature melting alloy which expands slightly when cooled, is poured into the cored holes to lock in the rods.

Alignment secured by clamping parts in a fixture.

Many hours machining time eliminated, with high savings in cost.

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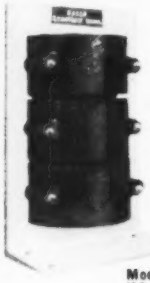

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• Separates oily sheets • Lifts polished or painted parts without scratching • Eliminates feeding double sheets • Saves gloves—cuts • Handles round, nested or odd shapes • *Permanence of magnetism guaranteed.*

Models for any thickness to 1/4"

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Max. Temp.	Sizes	Price
2000°	12" x 8" x 18" 12" x 8" x 24" 12" x 8" x 36" 15" x 12" x 30"	$1030 to $1485

All prices are less controls. Any standard controls available for automatic temperature control.

- Cooley modern design provides natural convection—increases uniformity. Heavily insulated large area door makes for low heat loss—reduced power needs.
- Natural thermal convection.
- Easily removable heating elements.

Controlling Pyrometers carried in stock — available for all applications.

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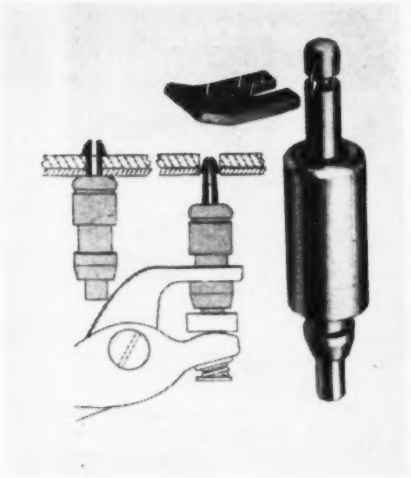

dustries as well. These tools hold materials such as templates, jigs, sheet metal, small fittings etc., in place during drilling, riveting, fabrication and assembly. They replace bolts and nuts for temporary fastening. They are applied from one side of the work and can be used over and over again.

Fasteners of both spring actuated and hand operated wing nut type, are available in a variety of sizes and capacities.

Solvent cleaner

A new solvent phosphating cleaner known as Solo-Phos is said to be a three-in-one cleaner. It removes grease and tar, cleans off chips and gives a rust-inhibitive phosphate coating.

Solo-Phos was developed by the Whitfield Chemical Co., Dept. BB, 14225 Schaefer Highway, Detroit 27, Mich., manufacturers of industrial metal cleaning chemicals and processes.

Used for one-step cold cleaning and phosphating of ferrous metals, aluminum and zinc, it reacts with organic or metallic soils. It has a high solvency for oil, grease, and tar and the rust-inhibitive film formed on metal surfaces makes a good base for painting. It can be applied in concentrated form by spraying, flushing, or dipping. Only standard equipment is necessary.

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TOOLS KEEP YOU AT TOP PRODUCTION WITH MINIMUM COST

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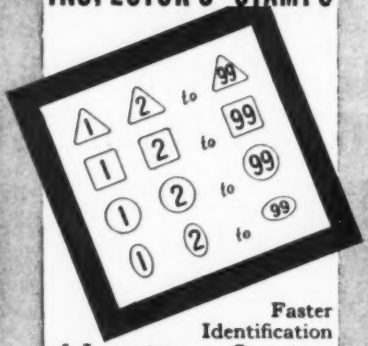

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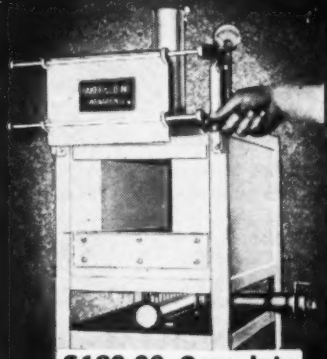

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Heating Chamber 7" Wide.
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Self-contained Drill Units are fully-automatic and cam-operated for positive quill action. They come in five sizes with drill capacities ranging from 3/16" to 1-1/2" (in mild steel).

These units are all available for *quick delivery.* You can mount them on structures of your own to make practical and efficient production machine tools.

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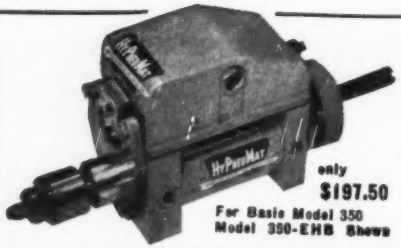

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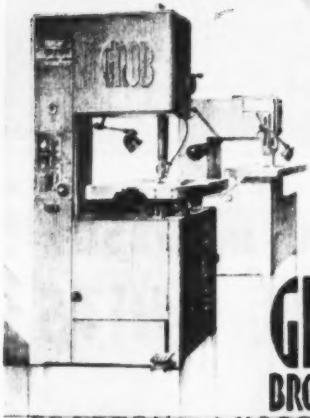

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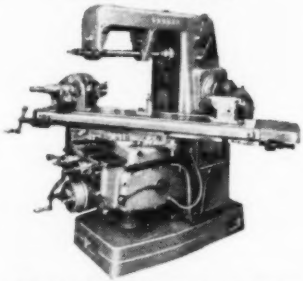

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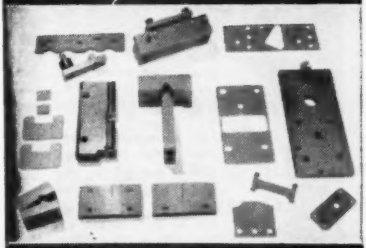
starting from scratch

WITH MARSHALL PRECISION GROUND FLAT STOCK



The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.

★ **WATERcrat:** A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.

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The Aristocrats of Ground Tool Steel

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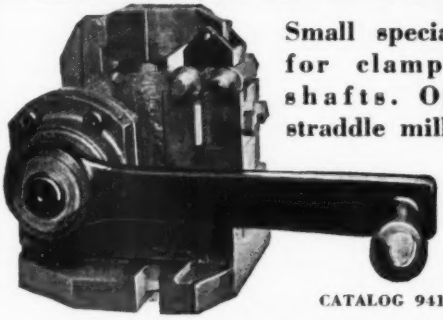
ALL TYPES OF HOLDING FIXTURES FOR MACHINE SHOP PRODUCTION



Small special fixture for clamping two shafts. Operation straddle milling ends.

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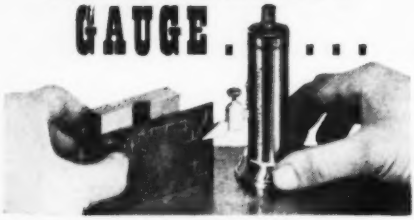

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Replace scriber with dial indicator and Micro-Height Gauge measures center distances between holes or surfaces. As indispensable as a micrometer to toolmakers, layout men, and inspectors.

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These fast, sturdy, easily operated machines put your riveting on a production basis in terms of speed and low cost. We'll gladly demonstrate what they can do and the high quality of work they turn out. Send samples of your parts to be riveted and we'll give you time and cost estimates on handling your rivet spinning on a LINLEY.

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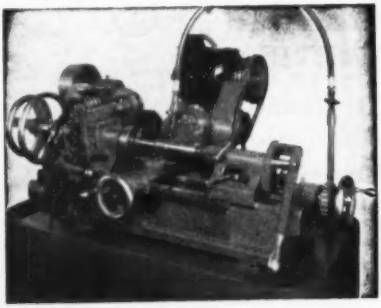

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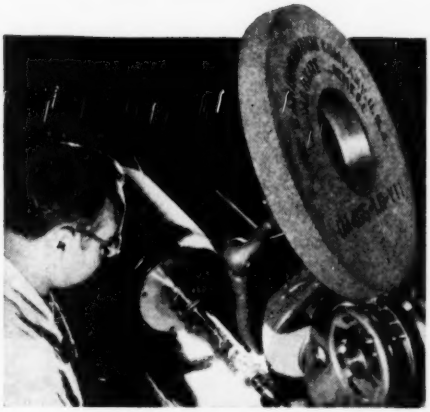

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81-321A

Hole punching units eliminate die sets

A new line of hole piercing units and notching units are being manufactured by Toolset, division of General Riveters, Inc., Dept. BB, 777 Hertel Ave., Buffalo 7, N. Y. The units are called Toolsets, and are self contained hole punching units that can be mounted on the lower bed of a press thus eliminating customary die sets. The press merely furnishes the force to drive the punch through the work piece. A free floating punch and guide transmits the load of stripping directly on the work instead of the upper arm of the holder. The punch and die are permanently and automatically aligned in the holder, a feature which the manufacturer claims will save many hours usually consumed in aligning punches and dies in conventional die sets.

Toolsets can be set up in any desired pattern by bolting the holder in position on a mounting template, or by locating and locking in a T slotted plate.

INDEXING FIXTURES

Provide faster finishing of multi-machined precision parts. Quick acting for easy set-up and fast indexing on wide variety of machines. Easily mounted at any angle on millers, grinders, shapers, drill presses, etc. Index plates with 24 notches for any multiple of 15° - one plate can be used to give 2, 3, 4, 6, 8, 12 or 24 index positions per revolution. Special plates furnished for particularly complex jobs.

Write for full information

GUSTAFSON ENGINEERING CO.
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A further savings is claimed by the maker due to the fact that the units can be re-used in any number of set-ups. Each holder accommodates a number of punch sizes which can be interchanged to suit the job requirements.

Stock sizes in holders are available in the following widths; 1", 1¼", 1½", 2¼", 2¾" and 3½" with from 4" to 16" throat depths. Each holder will accommodate punches for round, square, rectangular or special shapes.

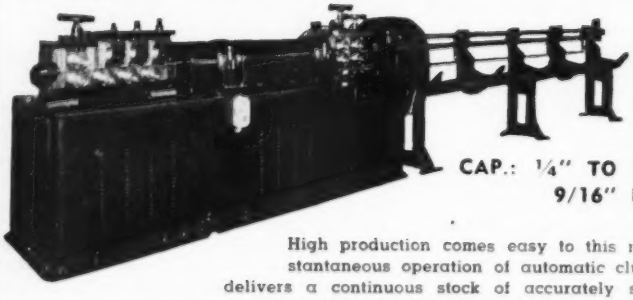
Rusnok mill head with 1 h.p. motor

The Rusnok mill head is now being made with a full 1 h.p. motor with capacity to ¾" end mill in steel, by the Rusnok Tool Works, Dept. BB, 4840 W. North Ave., Chicago 39, Ill.

This is in addition to the standard ½ h.p. motor furnished on the heavy duty and the ¼ h.p. which is standard on the low priced No. 70 convertical model.

SHUSTER *Automatic* — *Since 1866* — WIRE STRAIGHTENING AND CUTTING MACHINES

Straighten and Cut Wire at HIGH SPEED



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CAP.: ¼" TO ½" DIAMETER, 9/16" IN BASIC WIRE

High production comes easy to this rugged SHUSTER. Instantaneous operation of automatic clutch and cut-off cam delivers a continuous stock of accurately straightened, cleanly cut wire. Write for details on this and other versatile SHUSTERS.

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GRADUATED SWIVEL VISE FOR SHAPERS

Specifications:

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Base Size	12" x 14"
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Keys	11/16"

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Holes for Tee Slot Bolts— Your Specifications

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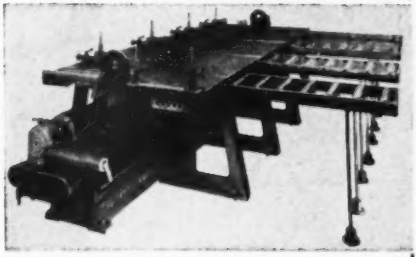
accurately, fast . . . with new "Oliver" Plate Saw



It cuts costs and speeds production in aircraft plants. Cuts plates up to 4" thick at speeds of 20" to 160" a minute. Maximum length of cut: 12', 24', 36'. Saw returns to starting position quickly. Lubricating nozzle on each side of saw. Write for details.

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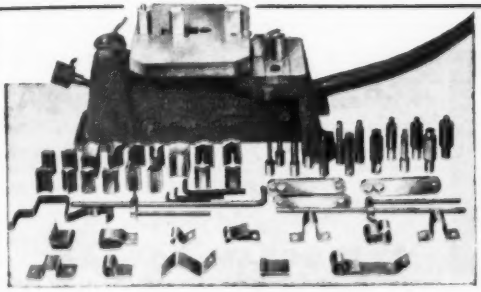

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CUTS, BENDS, PUNCHES

Available in hand or air operated models, the **MULTIFORM** is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to ⅝" x 1½" as illustrated, other models up to ¼" x 4".

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Portable electric marker

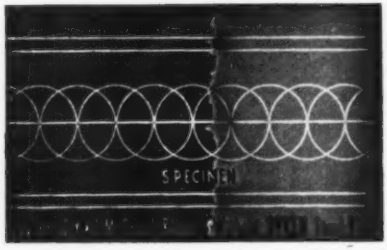
A new portable electric marker made in two sizes (standard and heavy duty) for freehand electrical marking on all steels (before or after hardening), alloy steels and ferrous alloys, in addition to cast and wrought iron, is announced by

the H. P. Preis Engraving Machine Co., 163 Industrial Branch, Hillside, N. J.

The ten station rotary switch and regulating knob are important features of this new marker because they enable the operator to make a light or bold mark at will by simple adjustment of the dial.

Mall has new aerial grinder

The new Mall aerial grinder, avail-



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Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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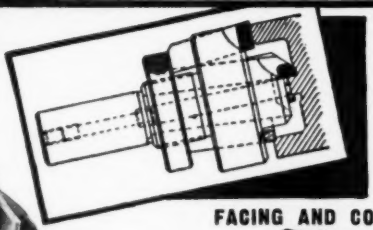
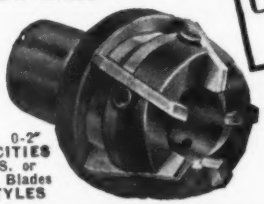


Your production tool problems are our problems. That's the reason many manufacturers turn to our engineering department for confidential assistance. Experience gained from more than 40 years of "know how" is yours for the asking. Write today for Catalog 48-H.



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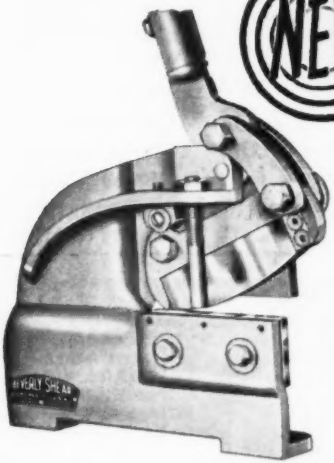

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CAPACITIES TO 3/16"

Get faster, easier slitting and trimming with a new design Beverly "SS" Series Slitting Shear. Rigid, strongly braced frame; compounded linkage and extra strength where needed. Many exclusive features. Write for FREE illustrated Bulletin.

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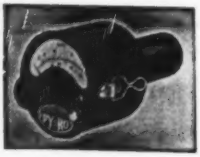

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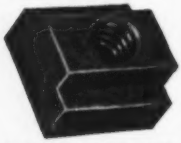

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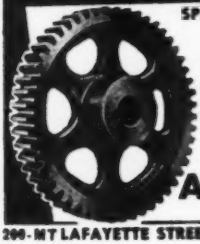

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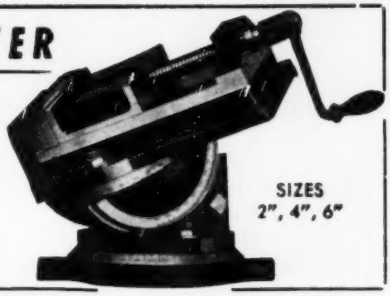


SIZES
2", 4", 6"

DONOVAN MFG. CO.
80 BATTERYMARCH ST. BOSTON, MASS.

able in three grinder sizes, is a new workhorse for industrial workbench or production in the welding shop, foundry, or auto body shop, according to Mall Tool Co., Dept. BB, 7725 South Chicago Ave., Chicago 19, Ill. The aluminum alloy housing cuts non-operative weight to a minimum. Ball bearings are used throughout the tool. Commutator and switch are fully enclosed to keep out dust and shop grit.

The 6"x1" wheel has a ⅝" hole, spindle speed of 3730 r.p.m. free; the 5"x1" wheel has ½" hole, spindle speed of 4430 r.p.m.; the 4"x1" wheel has ½" hole, spindle speed of 5560 r.p.m.

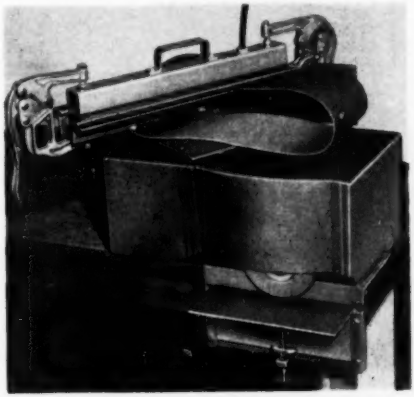
The grinder weighs 12 lbs. Dimensions are: length, 22"; width, 4.75"; height, 4.5".

Abrasive belt splicer

Changes in the Econaway abrasive belt splicer are announced by Aget-Detroit Co., 205 Main St., Ann Arbor, Mich.

Improvements include enclosure for the motor, the belt drive and the arbor which carries the grinding wheel, on top of which is mounted cutter and press bars; and an electrical curing press to reduce curing time from 24 hours to less than 60 seconds.

New press is electrically heated and temperature is controlled at the correct level by preadjusted thermostat.



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. . . with full length bearing precision bushings, O.D. ground true to I.D. ● We specialize in hole sizes #80 to ½", in any body size. Other sizes to your specifications. Production small hole drilling, our specialty.

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MOUNTED ON PEDESTAL

This is a powerful machine for heavy or small precision work in use all over the world: Airplane Factories, Ammunition Plants, Toolrooms where fast production is desired. 4 Models No. 16, No. 14, "EL" and Model "D". The larger the model, the larger the stroke and therefore more filing is performed. Furnished with or without pedestals.

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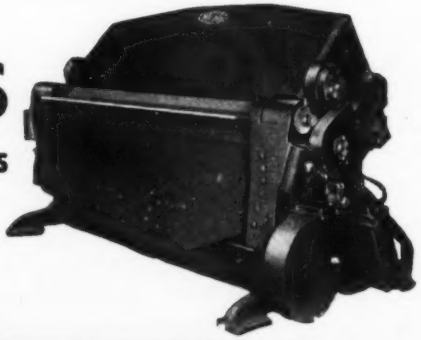

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Double Folder Brakes

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MANUFACTURING COMPANY
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CHICAGO
STEEL BENDING BRAKES
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PRESS BRAKES

Hyprez bench stand for diamond compound applicator

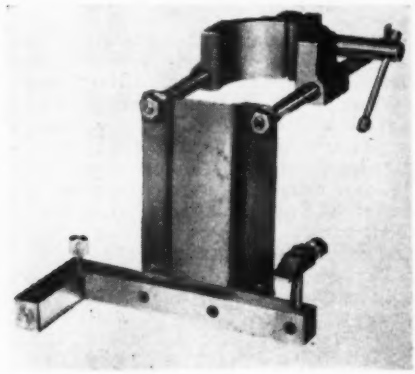
A bench rack for the convenient use of Hyprez diamond compound applicator guns has been designed and pro-

duced by Engis Equipment Co., Dept. BB, 431 S. Dearborn St., Chicago.

This stand will accommodate four applicator guns of any size (5 gram, 9 gram or 18 gram) providing clearance for the special Hyprez reduction needle; grooves for lapping sticks; a hook for fluid atomizer, and adequate shelf space for bobs, jars, etc.

Drill press safety-guide

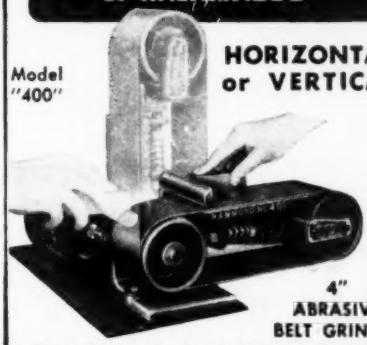
The Walker-Turner Div., Dept. BB, Kearney and Trecker Corp., Plainfield, N. J., recently announced a new type of drill press work guide and holder which is said to eliminate C clamps and other types of fastening devices. Attaching directly to the column of the drill press,



Hammond
OF KALAMAZOO

Model "400"

HORIZONTAL or VERTICAL



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Model H Test Indicator .001" **$22.50** with Universal Shank in Case

The Model "H" is a new type "Verdict" Dial Test Indicator incorporating many new features of design, combining sensitivity and accuracy with versatility of purpose. Tubular construction, combined with Friction Holder, facilitates application without resorting to extra attachments, in addition to which an extended reversible spigot is provided at the rear of the body for fitting direct to a surface gauge or similar stand. Also, the Contact Ball has a ratchet movement; it can be set at any angle within an arc of 180° and locks instantly and positively in position. Many other models in lever and plunger type indicators, .001" and .0001", standard and long travel. Made in England. We carry a complete line of measuring instruments with unconditional guarantee.

Dealers Inquiries Invited

TRANSOCEAN TRADING CO.

6453 Santa Monica Blvd. Los Angeles 38, Calif.

the Safety Guide is adjustable on the table and is locked in position with one locking screw.

It can be used to hold and position work without other fixtures, be used in conjunction with jigs or can be used to hold a standard drill press vise; will fit any drill press having either 2¾" or 3¾" columns. Models are available for bench, floor and multiple spindle type drill press.

New line of knife grinders

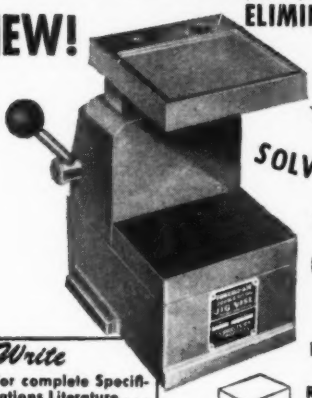
The Dependable Machine Co., Dept. BB, Greensboro, N. C., announces the development of a new line of hydraulic knife grinders. The Hydro-Travl Type NN grinders are said to sharpen any straight-edged cutter, whether knives and blades are made of high speed steel, carbon steel, carbide, or laid (tipped) high speed. Grinders have the following features: inverted

V ways which are self-adjusting to take up wear; 3 speed precision spindle Vee belt drive or direct motor drive; simple hydraulic drive; knife carriage which can be stopped immediately for checking knives; quick adjustment of grinding head unit for doing straight or hollow grinding; variable speed for travel of carriage; adjustable cross-feed; various types of grinding wheels; and wet grinding attachment.

Two models of these knife grinders are being built at the present time. They are the Hydro-Travl NN 320 (32") and the Hydro-Travl NN 480 (48").

POWERED-AIR DOUBLE ACTING JIG-VISE

NEW!



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CARBIDE TIPPED
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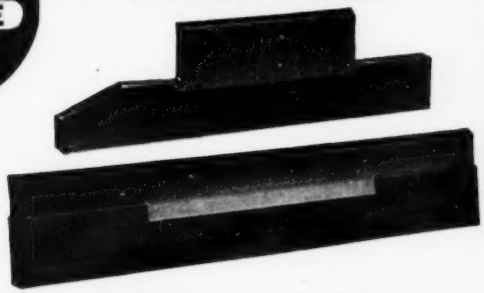


Standard thrufeed and infeed work support blades available from stock. Prices on special blades quoted on receipt of prints.

SPECIAL TOOLS—Prompt quotes on receipt of prints

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan

Camaction screw tool

A hammer blow on the handle of the screw tool made by Camdriver Co., Dept. BB, Box 51, Station A, Meriden, Conn., will force it down causing the cross pin to slide on the cam, thus giving the blade a sharp twist which is said to break loose rusted and frozen screws, loosen screws whose slots are paint or grease filled, mutilated or broken. Manufacturer claims screws

can be tightened as well as loosened, since the cam acts in either direction. Handle is solid steel, heat treated; blades forged and heat treated; cross pin hardened and ground.

Aerosol spray loosens rusted nuts and bolts

A rust-cutting oil, sprayed from an aerosol can at the flick of a finger, is said to help loosen corroded nuts, bolts and studs.

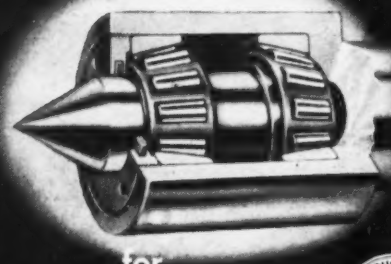
Rust-Cutter, product of James R. Kearney Corp., Dept. BB, 4236 Clayton Ave., St. Louis 10, Mo., is designed primarily for electrical linesmen, and is particularly useful in freeing rusted fastenings on hard-to-get-at equipment like crossarm braces, switch gear boxes, and similar power line equipment. It is packed in a six-ounce can that dispenses a fine spray when valve is depressed. A two-minute wait usually permits the compound to eat into the rust so the nut can be loosened easily. Du Pont Freon fluorinated hydrocarbon, the same chemical that acts as the cold-making agent in refrigerators, freezers and air-conditioning systems, serves as the propellent in the aerosol can.

Universal bevel protractor with vernier

Mercury Supply Co., Dept. BB, 410 Fairview, Elmhurst, Ill., announces a new steel bevel protractor with vernier which features an acute angle attachment for fast setting of fine acute angles

...accurate beyond comparison

Falls ROTO CENTER



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FREE BULLETIN 105 "What you should know about LIVE CENTERS"

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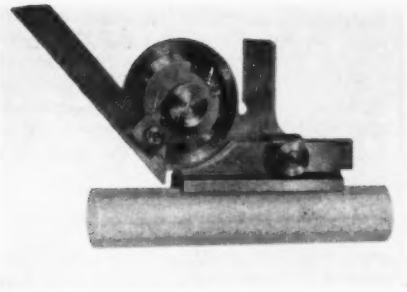


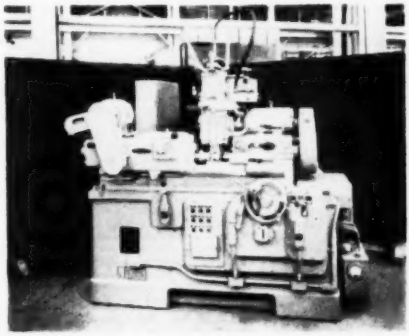
and a new design detachable base which keeps the tool in an upright position at all times.

It is said that this protractor gives extremely accurate readings over full 360° to 5 minutes (1/12 degree) from clear cut graduation lines that are recessed to eliminate wear. Mercury eccentric clamping and releasing mechanism holds blades independent of firm-holding thumb-nut, permitting blades to slide along their full length. There are no projections on the back side to hinder paper layout work.

Norton 6" x 8" semiautomatic piston grinding machine

Norton Co., Dept. BB, Worcester 6, Mass., has come up with a complete "packaged unit" for piston grinding with its new 6"x8" semiautomatic piston grinding machine.

It is said to grind elliptical automotive and aircraft type pistons to fine limits of size and finish. It can be specially arranged for grinding com-



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plex skirts where the degree of relief varies from the top to the bottom of the skirt.

The hydraulically actuated revolving feed screw mechanism provides hydraulic features for rapidly traversing the wheel head; there is a mechanical micrometer screw feed during the grinding feed stage.

Laminated fiber recharge for full flow filtering

An expendable, laminated fiber disc recharge has been designed by William W. Nugent & Co., Inc., Dept. BB, 410-12 Hermitage Ave., Chicago, Ill., for the full flow filtering of large quantities of oil. It is classed as an extended area recharge because its actual filtering area is greater than the area of its container.

In a recent test on a 1000 h.p. supercharged diesel engine at an oil company's pipe line station, the new laminated disc recharges are claimed to have kept the oil cleaner (0.02% by volume) for a period of 3500 engine hours or nearly 12 times as long as the recharges ordinarily used.

The laminated discs remove foreign solids smaller than two microns and the absorption of these solids after 48 hours of draining at 70 F. is 2½ times the weight of the recharge. Because no chemicals, bleaches or diatomaceous earths are used, the units will not remove vital additives from detergent oils.

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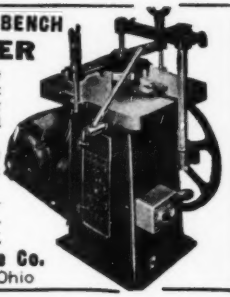

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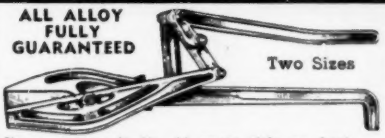

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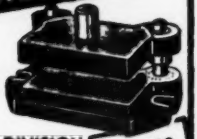

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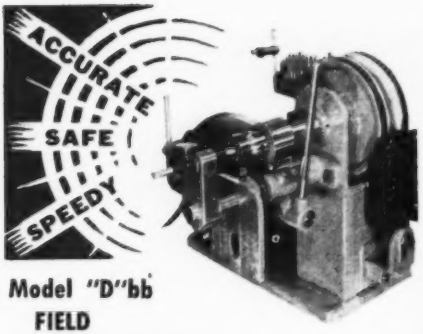

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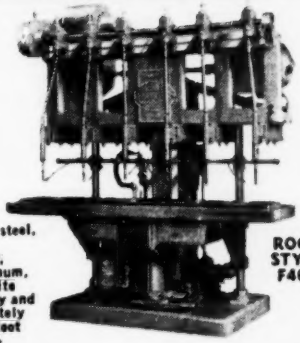

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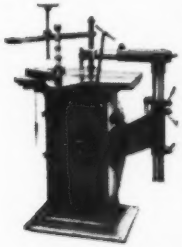

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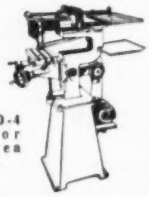
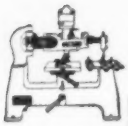
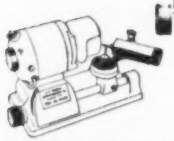


Model 2D-4 Tops for large area engraving.



Model UE for electric marking and acid etching.

Model CG Sturdy precision Cutter Grinder.



Illustrated above is the Model UE-3. The sight feature engraving machine, easily converted for Electric Marking or Acid Etching.

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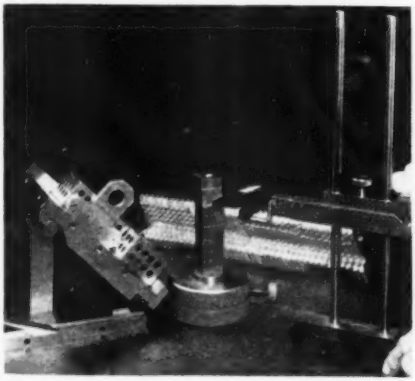
Height gage speeds inspection

A new indicator height gage and an adjustable inspection block that are said to provide for faster, more accurate precision inspection and layout work have been developed by Tietzmann Tool Corp., Dept. BB, Englewood, Ohio. The indicator height gage, set to master parts or standard gage blocks, is a precision instrument which can be quickly adjusted to approximate height and positively locked in place. Final



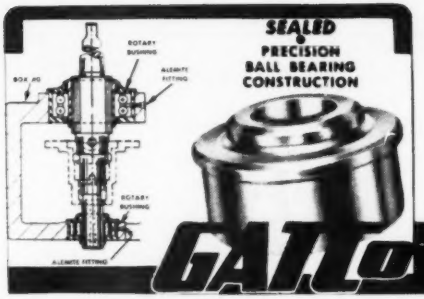
adjustments can be made quickly in millionths of an inch.

The indicator assembly travels freely on two vertical parallel rods and is locked to both rods with a knurled thumb nut conveniently located between the rods. This inherently rigid construction assures a positive, unchanging setting. It is available in three sizes; 12", 24" and 36" high. Both these new products were developed by the manufacturer, The Tietzmann Tool Corp., Englewood, Ohio.

Truarc "grip" ring locking collar

A low cost fastener that is said to provide a positive shoulder, secure against thrust and vibration, is the newest addition to the Truarc line of retaining rings. It is made by Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.

Designated as the Truarc grip ring—Series 5555—the retainer can be assem-



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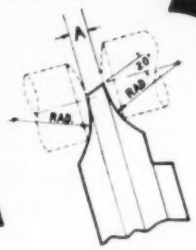
RADIUS CUT-OFF TOOLS

DOUBLE CROWN



No. 00 B & S	
Rad.	Price
1/8	$7.50
3/16	7.50
1/4	7.50
5/16	7.75
3/8	8.00
7/16	8.25
1/2	8.50

No. 0 B & S	
Rad.	Price
1/4	$8.50
1/16	8.50
3/8	8.50
7/16	9.00
1/2	9.50
9/16	10.00
5/8	10.50

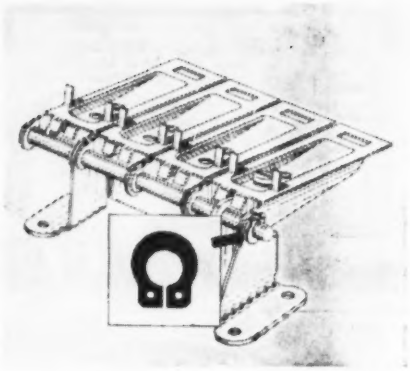
ORDER BY RADIUS AND MACHINE SIZE

Other standard radius tools from Stock: Front Crown, Rear Crown, Radius (90°)

These H.S.S. tools assure uniform, correct radii, better finish and appearance, less set-up trouble and maximum production at lowest cost. Full line of standard tools also available. **SEND FOR LATEST PRICE LIST.**

SOMMA TOOL CO., INC.

21 BROWN ST WATERBURY, CONN.

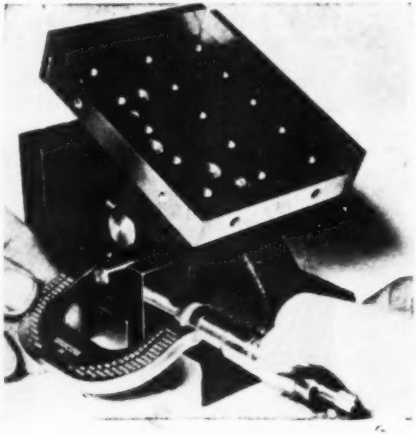


bled and disassembled in either direction on a straight, ungrooved shaft with Truarc pliers.

The basic Truarc design principle of complete circularity around the periphery of the shaft, and the ring's unusually large radial width combine to exert considerable frictional hold against axial displacement.

Unique sine angle plate

Any angle from 0 to 90 degrees can be set or measured quickly and accurately by use of the Bemisine angle plate, according to Mutual Machine Co., Dept. BB, Hudson, Mass. All that is required with this device is a two-inch



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PORTABLE
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SHAFT-GRINDERS

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4-SPEED
UNIVERSAL-TYPE Fully Ball Bearing

Flexibility and smooth operation make this durable, dependable unit paramount for maintenance or production. Shaft of rubber casing with steel reinforced ends. Write for sizes and prices.

Flexible shafts available for your motors.

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For Assembling
Keyway Cutting
Broaching
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Oil Grooving
Straightening
Forming
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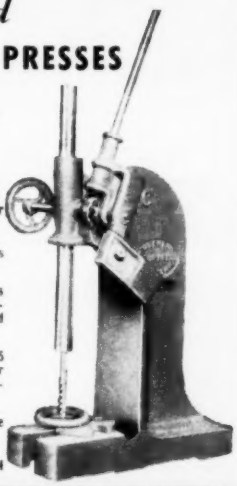
And many other jobs



65 Standard styles and sizes

From ¼ to 20 tons pressure for manually operated presses

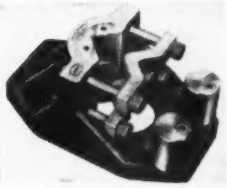
From 1½ to 75 tons pressure for motor driven hydraulic presses

Originators of the Arbor Press

Send for Cat. 40-H

GREENERD ARBOR PRESS CO.
141 CROWN ST. • NASHUA, N.H.

LASSY WORK HOLDER



Quick, accurate setups on lathes, jig borers, milling machines, grinders and drill presses.

Guaranteed accuracy .0005 in three inches. Made of finest cast iron, normalized for accuracy. Round steel insert hardened and ground. Recess in V for objects with heads.

Holes for work stops.

Eccentric counter weights for quick accurate balancing. Capacity ⅛" to 2". Size: 7" long, 4½" wide by 3 high. Weight: 8½ lbs. Finished in black crackle lacquer.

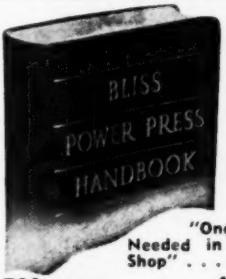
Model R
(Illustrated)
$49.00

Model P with quick acting swing clamp
$67.00

F.O.B. Plainville, Conn.

SETUP FOR TURNING OR GRINDING. Two bolts through base fasten work holder firmly to face plate.

LASSY TOOL COMPANY
108 Bohemia St. Plainville, Conn.



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"One or Several Are Needed in Every Stamping Shop" . . . *American Machinist*

700 pages • 450 Illustrations

Sections on: Computing press jobs • Selecting proper press • Useful engineering tables • Die illustrations • Complete glossary. Plus a service section for Bliss presses. $7.50

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1400 Raff Rd., S.W., Canton, Ohio

Rush me a copy of the Bliss Power Press Handbook.

I am enclosing $7.50 Bill me

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FACING TOOLS

For MASS PRODUCTION

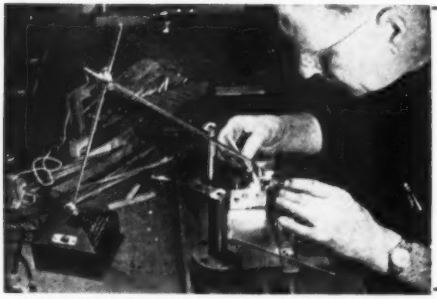
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES
Write For Complete Data

- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

Dealers! Here's a Profit-Maker!

COMET Tool Co.

738-MT Broadway, New York 3, New York



UNEEDA LIGHT directs a beam of white light on your close precision work . . .

Tool and Die makers acclaim it for its utility, getting into nooks or crevices hard to get at with ordinary light—for lining up punches in dies, or working with the scriber in close places. Completely adjustable and portable. Light does not reflect back to your face. Ideal for Inspectors seeking burrs, flaws, etc. Price—complete with 2 size bulbs $13.75

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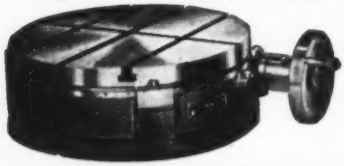
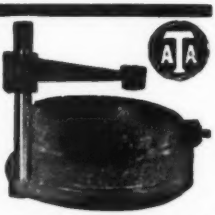
Twentieth Century Mfg. Co.
Box 429-B, Libertyville, Ill.

NO MORE COSTLY JIGS
on small production jobs with
Troyke Worm Wheel Operated Tables



Size:
9 - 12 - 15 - 18 - 21 - 25
See your dealer or write for Catalog No. 17

Fully illustrated showing all models and applications to various work.



Drilling attachments can now be furnished for Worm Wheel Operated Tables.

TROYKE MFG. CO., Cincinnati 9, Ohio, U.S.A.

Specify DESTACO FEELER STOCK

For precision fitting, checking clearances, inspection and production work. Available in 12" strips, ½" wide, in cellophane, packed 12 pieces of one thickness to a box; also in 25-foot coils. 14 standard thicknesses from .0015" to .015".

DESTACO DETROIT STAMPING COMPANY

MIDLAND AVENUE • DETROIT 3, MICHIGAN

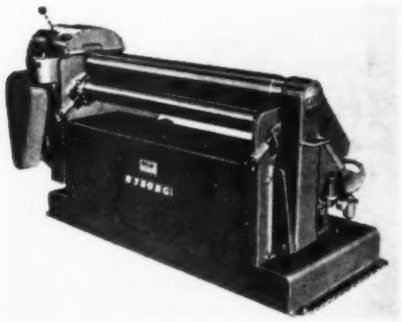
micrometer. The plate is set faster than the conventional sine bar or bevel protractor as no time is required for mathematical calculations or the setting of gage blocks.

The Bemisine is a drilled and tapped plate of oil-hardened tool steel mounted pivotally in a right-angle cast steel base. A measuring pin is located in the pivoting assembly and a measuring block is fixed in the base. Measurement by micrometer over the pin and block provide sine readings in true relationship to the angular position of the plate. (Gage blocks may be used between the pin and the block.) Angles to one minute accuracy are claimed.

Wysong introduces all steel 5 inch rolls

All steel, 5" rolls of the intial or pinch type, in five sizes, have been introduced by Wysong and Miles Co., Dept. BB, Greensboro, N. C. This new line is known as the series C, 5" rolls and is the first of a complete line of all steel rolls Wysong will build.

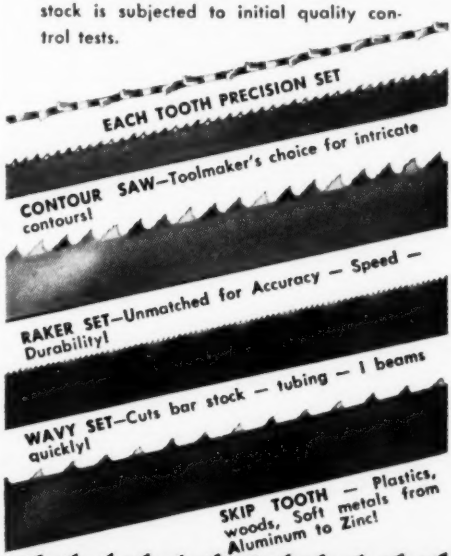
Frames are one-piece, all steel weldments. Rolls are accurately machined and polished alloy forgings. Each roll is power driven and is grooved to buyer's specifications. Machine cut, steel gears run in a continuous bath of oil, and automatically remain in proper mesh at



any roll setting. Roll setting indicator scales are mounted on both end frames. Wysong all steel series C, 5 inch rolls are available in sizes of 36"x3/16", 48" x 8 ga., 60" x 10 ga., 72" x 12 ga., and 96"x16 ga.

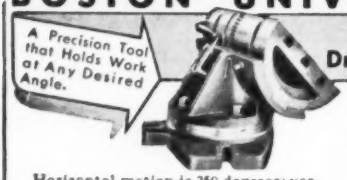
Atlantic
"EXTRAS"
Pay off in PRODUCTION and LONGER BLADE LIFE!

Here each roll of Atlantic raw band saw stock is subjected to initial quality control tests.


EACH TOOTH PRECISION SET
CONTOUR SAW—Toolmaker's choice for intricate contours!
RAKER SET—Unmatched for Accuracy — Speed — Durability!
WAVY SET—Cuts bar stock — tubing — I beams quickly!
SKIP TOOTH — Plastics, woods, Soft metals from Aluminum to Zinc!

Atlantic
ATLANTIC SAW MFG. COMPANY, Inc.
BREWERY STREET New Haven Connecticut

BOSTON UNIVERSAL ANGLE PLATE



Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Made in several stock sizes. Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc. 11 ARBORETUM RD. BOSTON 31, MASS.

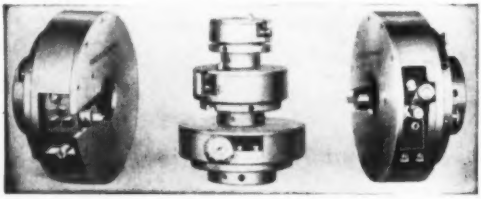
THE ORIGINAL

PLASTIC-TIPPED MALLETS WITH REPLACEABLE (BY HAND) THREADED TIPS

Now you can effectively avoid marring metal and plated finishes! Use Southwest Plastic-tipped mallets . . . the only plastic mallet with the threaded tips replaceable by hand. Plastic tips . . . solid alloy head threaded at both ends . . . non-sparking! non-magnetic! Since 1939 Southwest has led the field. Send today for illustrated literature and low prices. Send $1.00 for sample prepaid mallet.

SOUTHWEST MFG. CO.

P. O. BOX 1615, DEPT. B
SANTA ANA, CALIFORNIA



MUMMERT-DIXON

FACING HEADS

with Automatic Feed

One-way Tool Feed—6, 9 and 10" sizes.

Two-way Tool Feed—9, 12, 16, 20, 24, 30, 36, 40 and 46" sizes.

Save many costly set-ups.

Bulletin No. 4141 Gives Full Details

MUMMERT-DIXON CO., 122 Philadelphia St., Hanover, Pa.

CLOSED

TRADE **AUTOM** MARK

CLOSED

OPEN

Plain Type

Offset Type

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CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET

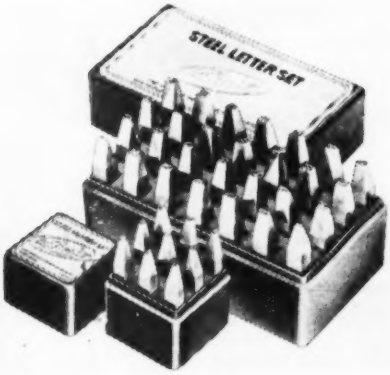
AUTO MOULDING & MFG. CO.
1110 E. 87TH ST.
CHICAGO 19, ILL.

SPECIFICATIONS:
Open width 7/8" to 6"
Gage Material .040 to .123
Pin Diameter .101 to 3/8
Lengths to 120"

SEMI-OFFSET

Stamping sets in plastic boxes

Steel number and letter sets in popular sizes, produced by The Parker Stamp Works, Inc., Dept. BB, 650 Franklin Ave., Hartford, Conn., are now packaged in durable plastic boxes for simplified selection and easy storage. Each container is fabricated from break-resistant plastic and features square holes to keep stamps in correct position, ready for instant use.



Parker precision steel number and letter sets are created for countless industrial marking applications. Seventeen sizes from 1/32" to 1" are produced with plain gothic style characters.

Versatile acetylene torch

It is claimed that practically any light heating, brazing or soldering operation can be performed by a new acetylene torch outfit recently placed on the market by the Torit Mfg. Co., 303 Walnut St., St. Paul 2, Minn. The unit uses only acetylene gas, from a Presto B tank, yet develops a temperature of 2800 degrees F.

Only a few pounds pressure is required to operate this torch handled by a regulator and gauge that is combined with the tank connection. The torch can be turned off and on by a built-in valve on the torch handle.

Four tips, an adapter unit, and a sold-

FRAY-TREE UNIVERSAL VERTICAL MILLING MACHINE

TURRET TYPE WITH TRAVELING RAM

COMPOUND ANGULAR SPINDLE SETTING

TRULY A PRECISION MACHINE TOOL

- BUILT BY TOOL MAKERS IN THE U. S. A.
- POWER FEED SPINDLE
- TABLE SIZE 9"x36" LONGITUDINAL RANGE 38"
- SENSITIVE AS WELL AS RUGGED
- MOLD MAKERS AS WELL AS DIE MAKERS HAVE APPROVED IT
- PROMPT DELIVERY

BANSBACH MACHINERY CO. BMC

MACHINE TOOL ENGINEERS

EStebrook 9-0210

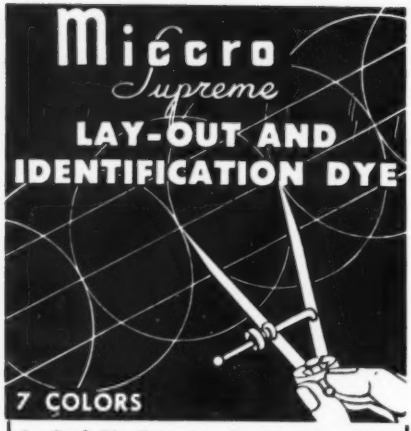
221 NORTH CICERO AVENUE

CHICAGO 44, ILLINOIS

ESTABLISHED 1919

Miccro Supreme

LAY-OUT AND IDENTIFICATION DYE



7 COLORS

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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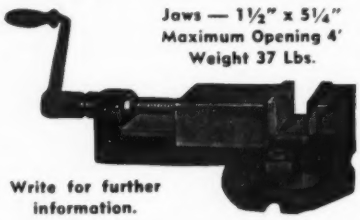
NEW BRITAIN

SWIVEL VISE

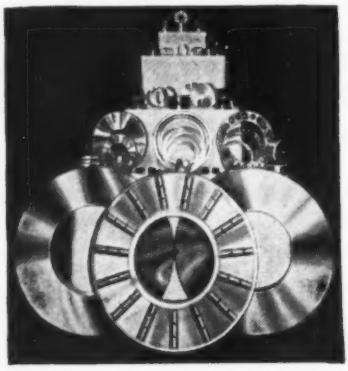


Jaws — 1½" x 5¼"
Maximum Opening 4'
Weight 37 Lbs.

Write for further information.

The body is made of semi-steel; the jaws of tool steel hardened and ground. All working surfaces are ground. The vise is as accurate as is possible and the degrees are cut to very close limits.

NEW BRITAIN TOOL & MFG. CO.
13 HARVARD STREET
NEW BRITAIN, CONN., U. S. A.



All Types of Thrust Bearings

We can make them up to 25" outside diameter. We are geared to handle all of your thrust bearing needs.

Inquiries Invited

ACORN BEARING CO.
68 STANLEY ST. NEW BRITAIN, CONN.

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the Quality Line

- WOODRUFF KEYS
- MACHINE KEYS
- MACHINE RACK
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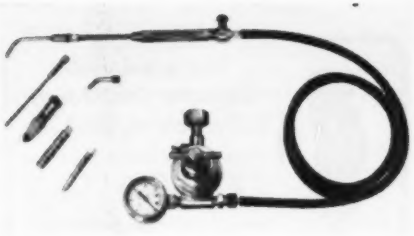
STANDARD HORSE NAIL CORP

Since 1872 NEW BRIGHTON, PA.



ering copper are supplied with each outfit. There are two long tips, one straight and one curved for reaching hard to get at places. One of the short tips gives a standard flame, and the other a large brush type flame.

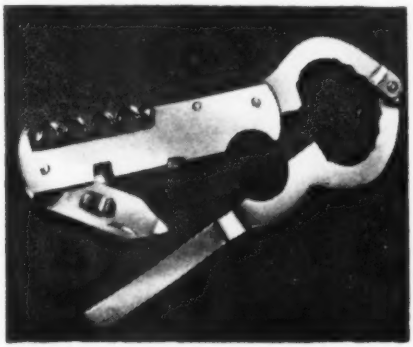
One big advantage of the soldering copper is that it reaches proper heat almost instantly, and holds that heat until turned off. Its rugged construction permits it to be used for all kinds of seam soldering.

A number of safety features have been built into this new Torit outfit.

Handy tool box gadget

A boon to mechanics, housewives, picnickers, barkeepers etc., this German-made gadget, available from Abbeon Supply Co., Dept. BB, 179-51 Jamaica Ave., Jamaica 32, N. Y., is said to unscrew or lift bottle caps, lift vacuum jar covers, pierce fruit juice cans, pull corks, cut celluloid bottle closures, lift soda bottle caps, crack lobsters and nuts, be used as a screwdriver, etc.

It is made of Chromed tool steel.



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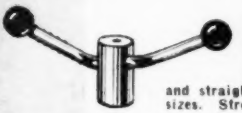
A Reliable SOURCE for

THREADED PLASTIC BALLS—Oval and Round

All sizes. Black. For machine tools, jigs, fixtures, etc.

CLAMPING HANDLES



All steel with plastic hand balls. In single or double offset and straight types in many sizes. Strong. Attractive.

CAST IRON HAND KNOBS Three Styles

Scalloped, long shank with wrench hexagon and prong types. Many sizes. Finest and most complete on market. Smooth finish. Dresses up product.

MACHINE HANDLES

Finest quality. Crank, straight and offset malleable types. Also forged crank, solid and revolving types, machined from solid bar stock. High luster finish.

HAND WHEELS Straight and Dished

Best quality. Both spoke and solid web types. Rims polished to high luster with or without solid or revolving handles.

REID TOOL SUPPLY CO.

Muskegon Heights, Mich.

MAIL COUPON TODAY!

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICH.

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Please send us FREE copy of 44 pg. catalog, illustrating and describing the REID line of necessary and hard-to-get components and accessories.

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City & State .....

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Small and Medium

SPURS (Internal and external)
HELICALS
STRAIGHT BEVELS
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WORMS
WORM GEARS
THREAD GRINDING

COMPLETE GEAR TRAINS

Send us your blueprints for estimate

BEAVER GEAR WORKS, Inc.
1033 Parmelee St., ROCKFORD, ILL.

Multiple Spindle Magazine Feed Power Screw Driving Machines

Latest type equipment for driving screws faster in products requiring two or more screws. These machines operate easily and require very little attention or adjustment once they are put in production.

Part Feeder

Automatic Part Feeders are adaptable to production jobs requiring the handling of small parts. Parts poured into hopper are arranged and fed down track in proper order. Send sample parts when writing for quotation.

COOK & CHICK CO.
640 SOUTH MILLER ST.
CHICAGO 7, ILLINOIS

Carbide Tipped Tools *Work Better* in a

Clark ADJUSTABLE TOOL HOLDER

Exclusive vise grip jaw runs full length of cutting channel... hugs bit so it can't rock, chatter, slip, sag or break... *permits faster feed, deeper cuts!* Holds all sizes—square, round, undersize or narrow bits for cutting off or special forming operations.

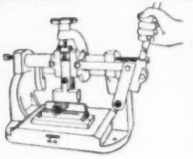
Also available with 15° cutter channel for H.S.S. tool bits.

For complete information call your Clark Cutter Jobber now or write Factory B

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd. • Beverly Hills, Calif.

Manufacturers of Precision Cutting Tools

MARK WITH ACROMARK



SERIES 9A MARKING MACHINES

They are simply adapted to almost any marking job. They come in several sizes.

- **Hand Driven**
- **Air Operated**
- **Motor Driven**
- **Combination Drives and Feeds**

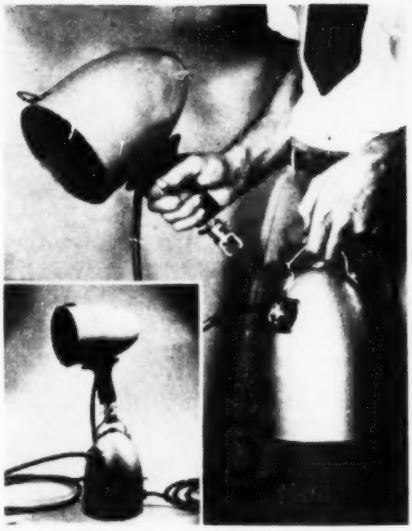
Write for complete details.

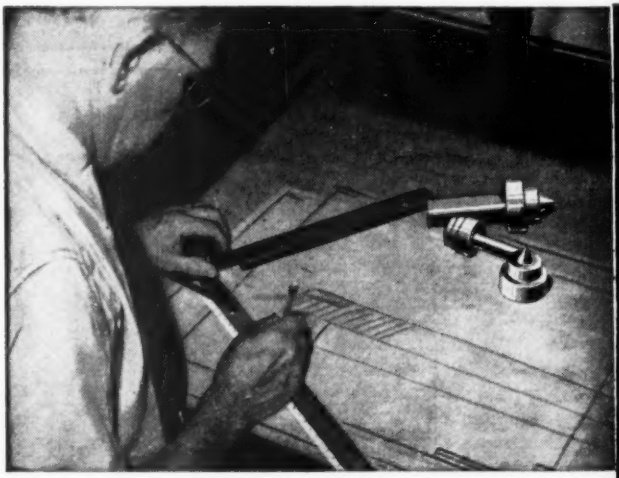
THE ACROMARK CO.
15 MORRELL ST. • ELIZABETH 4, NEW JERSEY

All-purpose black light inspection unit

A high-intensity, long wave Mineralight designed for use as a portable black light inspection lamp in scientific laboratories, and for industrial and agricultural inspection, has been announced by Ultra-Violet Products, Inc., Dept. BB, 145 Pasadena Ave., South Pasadena, Calif.

This Model B-50-H Mineralight is an intense 100-watt long wave ultra-violet hand lamp operating on 110-volt AC current; throws a powerful directional beam of long wave (3660 A. U.) ultra-violet up to 30 feet away; will clamp rigidly to its non-tip base (containing transformer) and may be permanently locked to any desired position. Unit has easy-to-grip plastic handle, heavy three-conductor primary and secondary cords, and is said to be specially designed to burn cooler, assuring longer bulb life. Radiation is non-injurious, harmless to eyes or skin. The B-50-H is useful in detecting oil leaks in machinery or on fabrics, because under activation by ultra-violet the slightest trace emits a bright glow.





Engineered Live Centers . . . A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job is set up with the right Live Center. Standard shanks with Morse taper carried in stock.

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You can order for **immediate shipment** from our stock 76 styles of punches and 65 styles of dies in round, flat, oval, and square sizes to fit most makes of presses.

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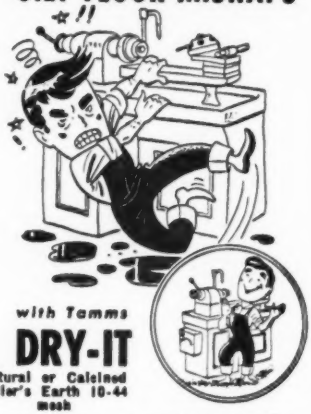

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BOLSTER & T-SLOT TYPES
to J. I. C. press room standards

Forged, precision machined heat treated. Tensile strength 150,000 lbs.

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BOLSTER BOLTS — dia. to 1½". Heads sq. to 3" hex to 2⅝" T-Slot bolts, ½", ⅝", ¾" dia. lengths to 12". 1" dia. 4" to 22" long.

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COUPLING BOLTS
MILLED STUDS

*Wm. H. Ottemiller Co.
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FORNEY

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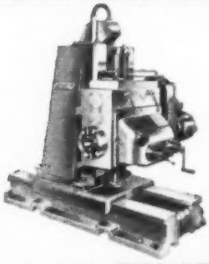

1st and FINEST

Machine features a spindle housing as motor power unit which moves directly into work face. Results in more accurate work, more power and rigidity in cutting tool. Facing head capacity to 66 inches. Weight of standard machine 15,000 pounds.

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Manufacturers of Special Machinery Since 1916
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Ever have a tap or drill break in an expensive part? . . . so that even careful drilling couldn't save it? Today, parts costing as little as 50c can be economically salvaged by an Elox Electron Drill.* They're real money savers! No plant can afford to be without one. Write for particulars.

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MACHINE-CUT
METHODS

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Let us quote on *best* method, without partiality.

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BLACK GRANITE SURFACE PLATES

Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause humps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping. Most durable.

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Avoid substitutes
Immediate delivery in most sizes from 9x12 to 48x144.

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Cut your reaming costs in half with the inserted blade — both adjustable and replaceable.

Rogers **ADJUSTABLE BLADE REAMERS** combine low initial cost with **fractional replacement cost** after inserted blades are worn to adjustment limit.

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Every Punch Press Operator *Needs* the "Safety" of a ▶ SAFEED *Patented*

Prevents Injury — Saves Glove Costs
Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED.

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M-10

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HEIMANN TRANSFER SCREW SETS

IN 11 SIZES—No. 6 to 1" N.C. In all S.A.E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

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Re-Designed
Added
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POWER FEED FOR FACING

A Boring Head That Won't Face Is Not Complete.

Boring, Facing, Turning, Grooving, Undercutting—All in ONE Toolhead

CHANDLER TOOL COMPANY
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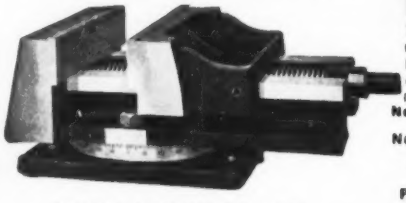
SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

No. 48 10" jaws, 2¼" deep, opens 8½", Weight 125 lbs. **$110.88**

No. 4, 6" jaws, 1½" deep, opens 5", Weight 45 lbs. ..... **$ 81.84**

Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

Prices are net, f.o.b. Chicago. Write for illustrated folder today. Dealers inquiries solicited.

J. E. Plunket Machine Co. 3230-32 Archer Ave. Chicago 8, Ill.

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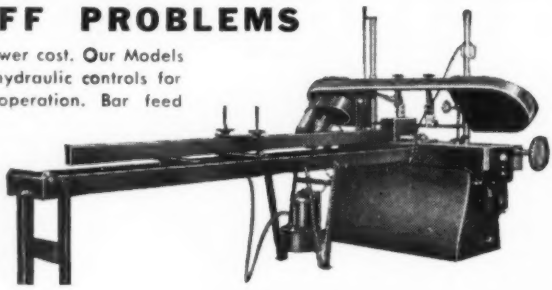
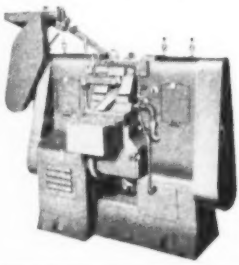
Do a REAL job—faster and at lower cost. Our Models M, D, and J feature simplified hydraulic controls for both full and semi-automatic operation. Bar feed (shown here on Model M), other accessories, and hinge-type saws also available. Write for literature.



W. F. WELLS & SONS
THREE RIVERS, MICH.



for speedy drilling

OF COTTER PIN HOLES IN SCREWS, BOLTS, ETC.

The KENT *Duplex* DRILLER

Two drills move toward the center. One drill then withdraws and the other completes the hole. Parts can be drilled and countersunk at the same operation. Semi-automatic or full automatic feed. *Write for illustrated descriptive literature.*

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Drillers - Threaders - Slotters - Countersinkers - Bar Pointers

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SAVE UP TO 85%
NEW
INSIDE – OUTSIDE
VERNIER CALIPERS
German made by one of Europe's leading specialists in precision tools. Measures inside-outside & depth in .001" to 6" in 1000ths and 1/10mm to 150mm in 10ths. 9.75
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Handy stand magnifier with universal adjustments. Overall height 6". Has powerful, clear magnifying lens. 1.99
BENDIX HYDRAULIC
PUMP & MOTOR
Has 3-1/2 GPM capacity at 600 PSI. Motor is 1½ HP, 24V, D.C. Will operate on either 12 or 32V, DC current. Has built-in relief valve adj. to 1500 PSI. This unit ideal for hyd. lifts, portable loaders, etc. 19.50
MAGNETIC BASE – INDICATOR HOLDER . . .
A time saver for precision checking. Magnetic base fits curved or flat surface. Has 45-50 lb. pull. Stainless steel 6½" rod mounted in ball socket permits universal settings . . 3.95
Note: We have complete line of instruments, depth gauges, inspection mirrors, etc.
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Heavy duty, G.E. Gear Head motor. 2 HP, 24V. DC, 125 amp., reversible motor drives a reduction gear unit giving 36 to 1 ratio at take-off. Also will operate on 6 or 12 volts.
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36 to 1 G.E. (306 shaft RPM)
28 to 1 Eclipse (130 shaft RPM)
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Hundreds of uses for any mechanical device needing controlled 2 way action. Opens, closes, raises or lowers doors – windows – gates – valves.
CTU-2 – Foote Linear Actuator – 24 volt, DC, 8500 RPM, 1/6 HP – series wound motor. 4½" stroke in 13½ sec. Compression and tension loads up to 750 lbs. Adjustable micro switch for limits of travel. Overall lngth., retracted 11" 7.95
We also carry many more sizes and types of Actuators. Write today for information.
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Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore, 18" stroke; 30½" length. Ideal for road farm – shop machinery. 29.75
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Double action. Bore is 1" – Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. Intermittent. Will lift or push up to 1100 lbs. 5.75
We stock over 50,000 Hydraulic Cylinders, Valves, Pumps, Accumulators, Hand Pumps, Motors, Hose, etc. All at Money Saving Prices.
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230 Pg. CATALOG
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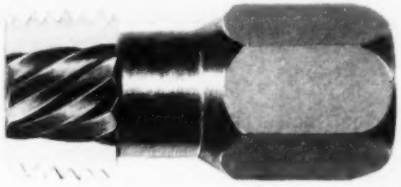
LOS ANGELES 58, CALIF.
Order from this ad. Pay by M.O. or check. P.O.'s accepted from D&B firms. ½ deposit with C.O.D.'s.
All Prices F.O.B. Los Angeles

Extracting tool announced by Roddick Tool Co.

A new extracting tool that is said to remove threaded broken parts without wedging them into place is now being marketed by the Roddick Tool Co., Dept. BB, 1023 N. Pauline St., Anaheim, Calif.

The extractor is made to work with any fitting in the pipe, hydraulic, aircraft, plumbing or mechanical fields and is now available in a range of 20 sizes. Sizes ⅛" to ⅞" by 1/32" complete the Roddick extractor line.

This extractor is designed to form teeth inside the hole until the shoulder contacts the part and permits a high torque without expanding the part.

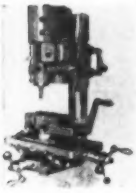


The MARKET PLACE

Advertisements acceptable in THE MARKET PLACE include those for employment, sales services, production facilities, representation and related needs. **Rates: $12 per column inch per insertion. Maximum size advertisement accepted in this section is two inches.**

Copy should reach us by the first of the month for next month's issue.

MACHINE and TOOL BLUE BOOK **A Hitchcock Publication** **Wheaton, Ill.**



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LOW COST VERTICAL MILLING MACHINES

Full Line of Vernier Calipers and Height Gages

Splendid Opportunity for Dealers

Masters **3613 ARCHER** **CHICAGO 9, ILL.**

CUTTER GRINDING

ALL TYPES OF MILLING CUTTERS RESHARPENED

End mills, reamers, counterbores, etc.

1 Week Delivery **Low Cost**

Send Parcel Post To-

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11 Meadow Street

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MANUFACTURER'S REPRESENTATIVES

Leading gage shop in Detroit area. For West and Middle West territories.

Write P.O. Box 195

c/o MACHINE and TOOL BLUE BOOK

Wheaton, Illinois

SHOP SUPERINTENDENT wanted by expanding machinery dealer, specializing in rebuilding airtools, riveters, and plant equipment. Good pay for energetic man who can supervise 4 to 6 men and make own repair parts when necessary. Write fully in confidence, giving qualifications, experience, salary expected. Montgomery Engineering, 1736 W. Philadelphia, Detroit 6, Mich.

IMPORTED PRECISION TOOLS

Vernier Calipers up to 80" - Height gages up to 48" at savings up to 40% to the user and excellent proposition for dealers.

DEALERS' INQUIRIES INVITED

Territories Open ***We Carry the Tools in Stock.***

Box 199 c/o MACHINE and TOOL BLUE BOOK Wheaton, Ill.

ANOTHER LINE

of machine tools or related equipment can be handled in the middle west by an established aggressive manufacturer's agent who is now contacting distributors and industrial accounts. Present principals know of this advertisement.

BOX 197
MACHINE and TOOL BLUE BOOK
WHEATON, ILLINOIS

DIAMOND TOOL SALESMAN

MAN WHO HAS SOLD SMALL TOOLS OR SPECIALTY TOOLS

Successful Sales Representative Looking For A Quality Product. Liberal Commission

Representatives wanted. Contact us at the Cleveland Metal Show, Booth 2752, October 19-23

NATIONAL DIAMOND LABORATORY
108 Fulton St. New York 38, N. Y.

For 30 Years— **EXPERTS**

AT STAMPINGS

IN SMALL LOTS

SHORT RUNS

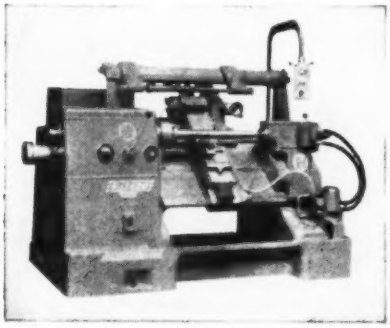
DAYTON ROGERS
Manufacturing Company

Minneapolis 7, Minnesota

New York City, Chicago, St. Louis, Denver, Cleveland, Baltimore, Pittsburgh, Milwaukee, San Francisco, Indianapolis, Detroit, Dayton, Ohio; Rochester, N. Y.; Grand Rapids, Mich.; Newton, Mass.

Push-button metal turning

Said to be the first completely automatic hydraulic copying lathe equipped with a hydraulic carriage feed, the H.E.B. Pilote has just been introduced into the U.S. and Canada by H.E.B. Machine Tools, Inc., Dept. BB, 475 Fifth Avenue, New York 17, N.Y. The operator has only to load the machine and press a button to start the cycle; when



the part is finished the tool returns to its starting position and the spindle stops automatically.

The setup can be completely changed in less than an hour, it is claimed. Both roughing and finishing may be carried out simultaneously by utilizing one or more tools. The machine may be arranged for boring and outside turning at the same operation.

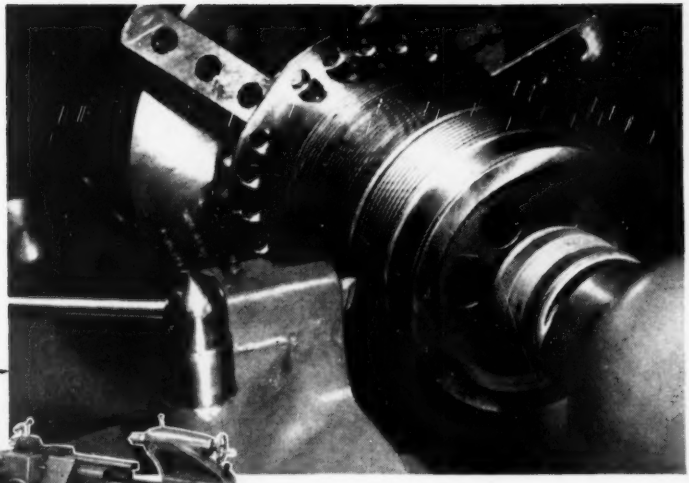
The cross-slide is arranged at 90° to the bed and provided with slots for both front and back tools as well as a boring bar. Its tranverse motion is controlled hydraulically by the copying device, following a flat templet fixed in an indexing drum which is designed to carry a maximum of eight different templets. The front and back tools may both be used for copyturning, using a different templet for each cut. The back tools can also be arranged for plunge cutting automatically. In addition, the back tools may be used for taking a light finishing cut, utilizing the Z stop which enables tolerances of .0005" to be maintained on production runs. A surface finish of better than 32 microinches may be maintained.

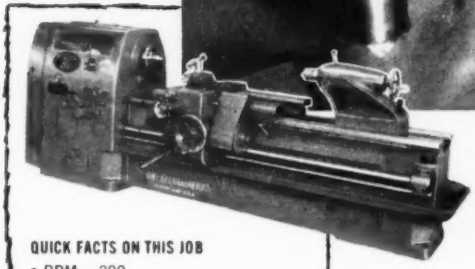
Mechanics Through The Ages

ONE OF THE EARLIEST METHODS OF **DIE—STAMPING** WAS THE *12 CENTURY* PRACTICE OF USING TWO PLATES, FITTED WITH HOLLOWS, TO FORM SOFT METAL BEADS: THE SOFT METAL WAS PLACED IN THE HOLLOWS OF ONE PLATE, THE SECOND PLATE WAS FITTED OVER THE FIRST— AND THE TWO PLATES WERE POUNDED WITH A **MALLET** TO SHAPE THE BEADS....

PLANTATION NEGROES, IT IS SAID, SHORTENED THE NAME OF *Eli Whitney's* COTTON "ENGINE" TO **COTTON "GIN"**

THE **FIRST** KNOWN **UNIVERSAL JOINT** DATES BACK TO *1545* WHEN IT WAS DEVISED TO USE IN THE MAKING OF A **COMPASS**.....





QUICK FACTS ON THIS JOB

- RPM – 200
- Cam – 3"
- Passes – 10
- Tool – Single Carbide
- Finish Obtained – 15/30 micro inches
- Time – 50 seconds

FAST THREADING FOR FLYING HORSEPOWER!

with the AMAZING

CRI-DAN "D"

● Speed-threading with unusual accuracy is nothing new for the Cri-Dan "D". But as the machine's reputation spreads, it is given tougher and tougher jobs to perform.

In this case it is threading an aircraft radial engine cylinder barrel with a 6-pitch, special buttress thread. Using a single point carbide tool and running at 200 RPM, the operation was completed in 10 passes requiring 50 seconds for the operation.

If you, too, have difficult threading jobs requiring speed as well as accuracy it will pay you to learn the facts about the Cri-Dan "D". For additional information get in touch with your Lees-Bradner representative – or write to us direct.

the **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.

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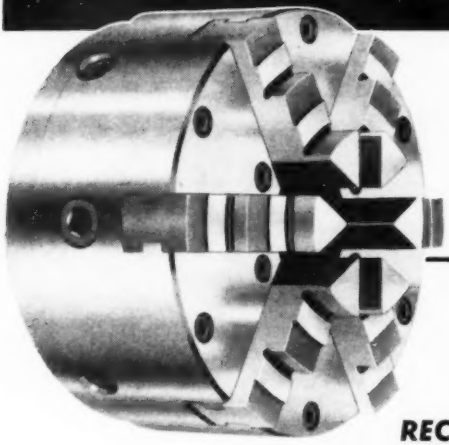

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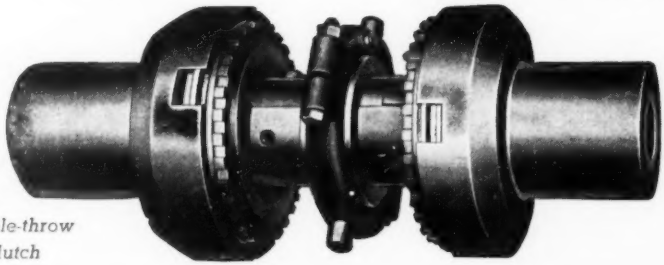

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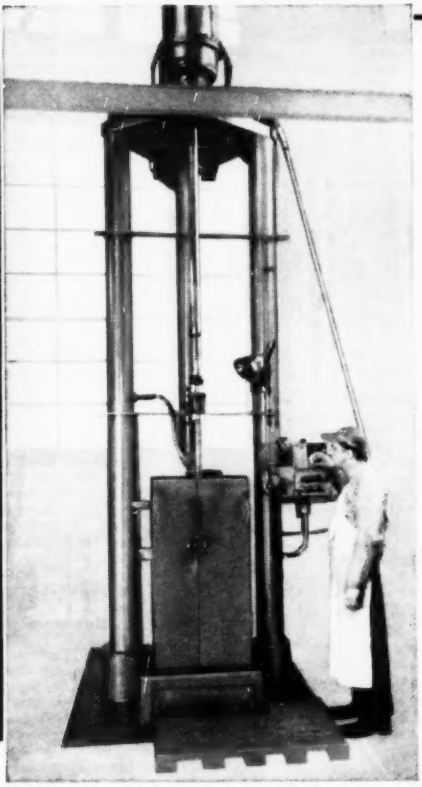

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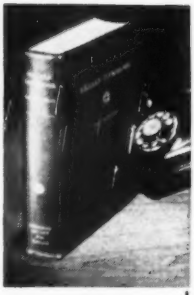

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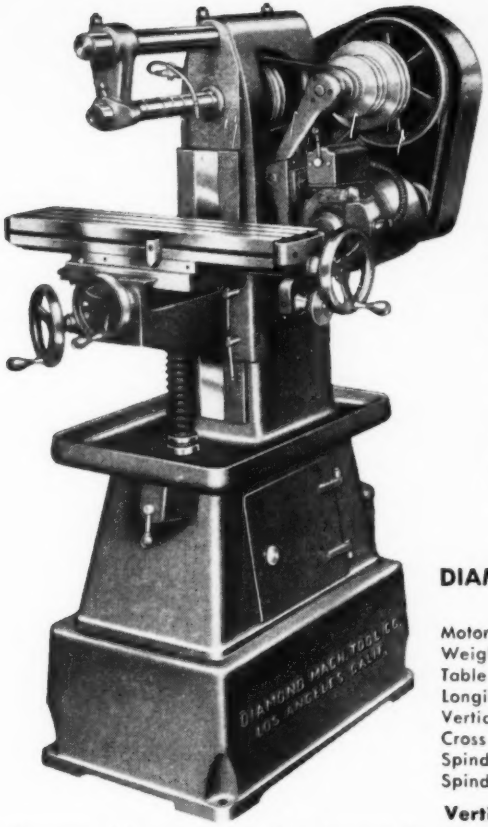

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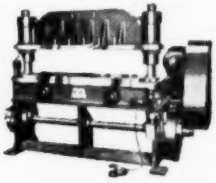

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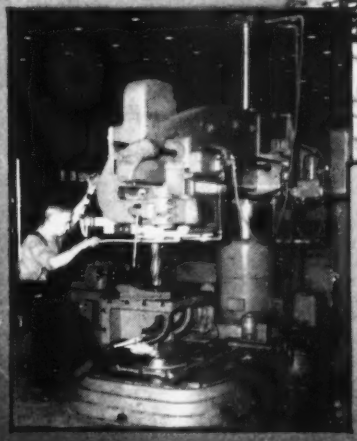

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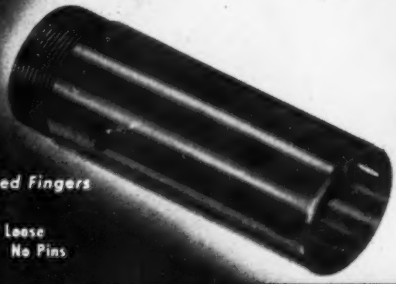

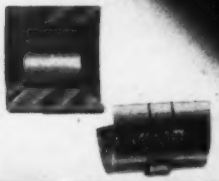

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